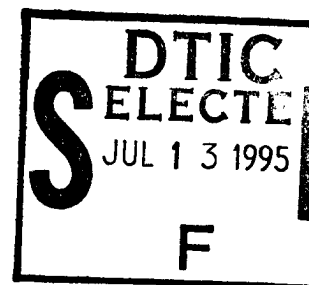
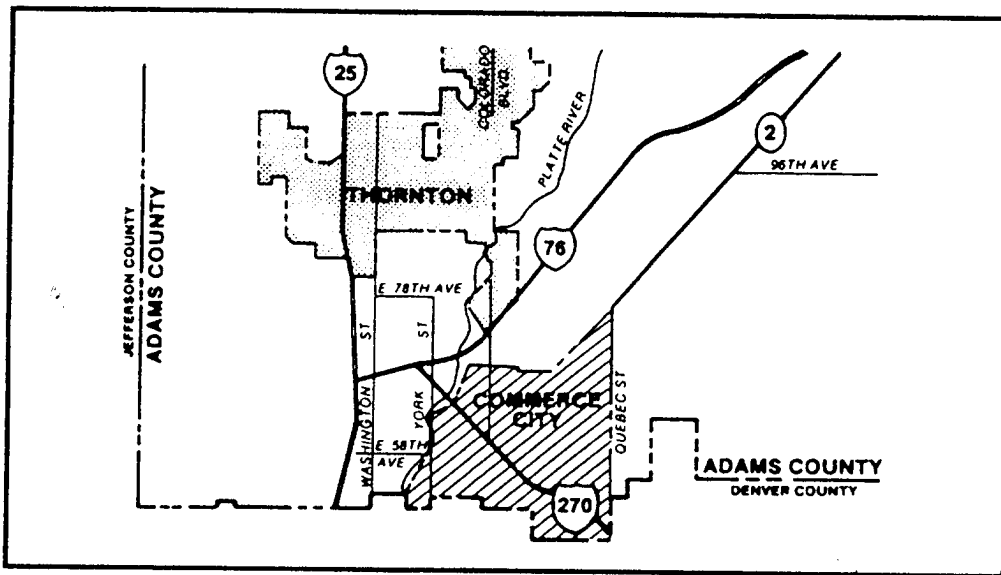
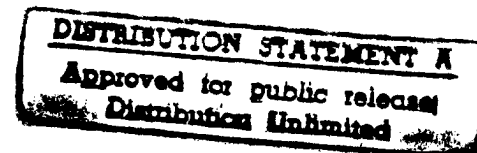


Final Report

96th Avenue/Quebec Street Area Transportation Study



Submitted to
**Adams County
 Commerce City
 City of Thornton**



Submitted by
CH2HILL
April 1988

**Rocky Mountain Arsenal
 Information Center
 Commerce City, Colorado**

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Mr. Steve House, A.I.C.P./Commerce City
Mr. Gene Putman, P.E./City of Thornton
c/o Adams County
4955 East 74th Avenue
Commerce City, Colorado 80022

Gentlemen:

CH2M HILL is pleased to submit the final report for the 96th Avenue/Quebec Street Transportation Study. The recommendations should help to establish an integrated transportation network throughout your communities.

We have enjoyed the opportunity to assist you with this study. We appreciate the cooperation and assistance we have received from you and your staff and look forward to future opportunities to work for Adams County, Commerce City and the City of Thornton.

Sincerely,

Tom Ragland

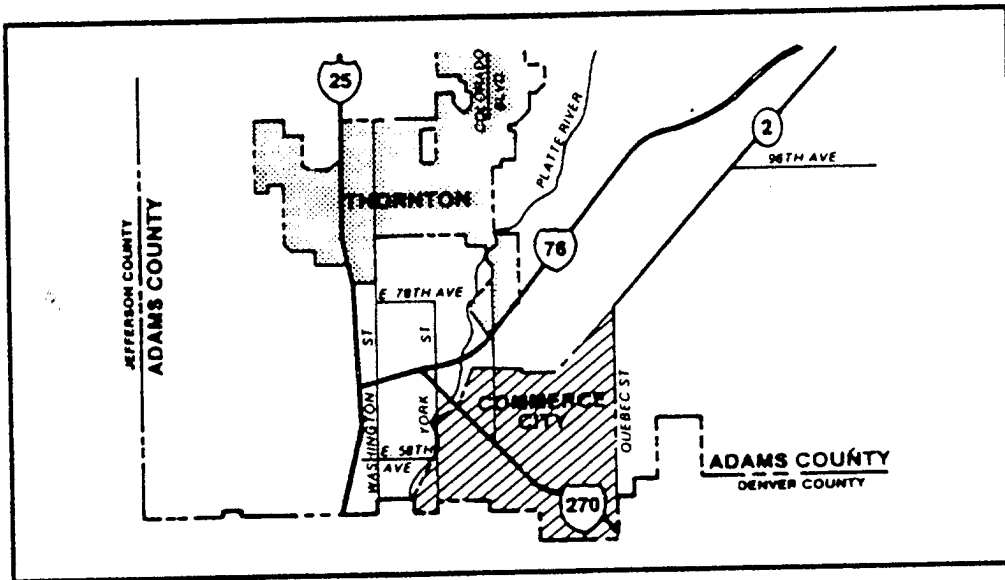
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Project Manager

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Final Report

96th Avenue/Quebec Street Area Transportation Study



Submitted to
***Adams County
Commerce City
City of Thornton***

Submitted by
CHM HILL
April 1988

EXECUTIVE SUMMARY

INTRODUCTION

The 96th Avenue/Quebec Street Area Transportation Study was undertaken by Adams County, Commerce City, and the City of Thornton to establish an integrated transportation network throughout their communities. Specifically, the study addressed the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, and Colorado Boulevard/York Street corridors within the overall boundaries of 120th Avenue on the north, I-270 on the south, York Street on the west, and Peoria Street on the east. The primary goal of the study was to recommend a feasible alignment in each of the study corridors so that ultimate right-of-way needs can be determined.

METHODOLOGY

The four major tasks of the study were: (1) Data Collection; (2) Transportation System Analysis; (3) Typical Section Identification; and (4) Alternative Alignment Analysis.

In the Data Collection task, previously prepared transportation studies, available utility information, master drainage reports, property ownership information, and recreation and parks/open space plans were collected and reviewed.

The Transportation System Analysis task involved three primary elements. First, this task included a transportation planning element to identify the roadway needs within the study corridors including 96th Avenue between Colorado Boulevard and Peoria Street, Quebec Street between 120th Avenue and I-270, and a Colorado Boulevard/York Street connection

between 88th Avenue and I-270. The second element of the Transportation System Analysis was a traffic analysis to identify the number of lanes required for each study corridor to meet the forecasted traffic volumes. Finally, the third element was identification of intersection geometrics.

As part of this task, year 2010 traffic volume forecasts were prepared for the study area corridors. Previous studies completed for the study area were the basis of this effort. No additional traffic modeling was performed.

Also, for the Transportation System Analysis task, roadway lane needs and intersection operations analyses were based on the year 2010 traffic volume forecasts. The long-range transportation demands that can be expected from an area buildout scenario were used to define ultimate right-of-way needs.

The Typical Section Identification task consisted of determining the laneage requirements for the study corridors at a level of service (LOS) of C or better. As part of this task, the general right-of-way widths for an "ultimate" or buildout scenario were developed for each corridor.

The Alternative Alignment Analysis task consisted of developing a set of feasible alignment alternatives for each study corridor, evaluating these alignments based on a criteria matrix, and finally, recommending the most feasible alignment for each corridor.

In addition to the major tasks indicated above, the study also included a program of public involvement and coordination. During the course of the study, meetings were held to inform the public and agencies having transportation jurisdiction in the area of the status of the study and to

solicit input and concerns. Two public meetings were held to inform the public of the project and to solicit comments and input. The input from citizens at public meetings and agency representatives at technical review meetings was used to help develop and adjust alternative alignment evaluation criteria and was incorporated into this final report.

A Technical Committee was organized for the study. The committee was comprised of representatives of Adams County, Commerce City, the City of Thornton, the Colorado Department of Highways, the Denver Regional Council of Governments, the Department of the Army-Rocky Mountain Arsenal, Urban Drainage and Flood Control District, and CH2M HILL. The purpose of the committee was to coordinate the study with federal, state, and local jurisdictional agencies. Committee meetings were held to discuss project status and to solicit input concerning issues in the study area.

RECOMMENDATIONS

The following recommendations are the result of the major study tasks described previously. Included are overall roadway system recommendations for the study corridors, lane requirements and intersection recommendations, and recommended alignments for each of the study corridors.

ROADWAY SYSTEM RECOMMENDATIONS

The primary recommendations for the roadway system in the study area are listed below in their relative order of priority. An expected timeframe of need is given based on the year 2010 traffic demands.

- o Colorado Boulevard should be extended as a principal arterial south from 88th Avenue and connected

to York Street north of State Highway (SH) 224. There is an existing need for this connection.

- o Quebec Street should be extended as a regional arterial south from 120th Avenue to connect to Vasquez Boulevard at US 85. This connection should be needed in 5 to 10 years.
- o 96th Avenue should be extended as a principal arterial across the Platte River to provide access to the new airport. This connection should be needed in 5 to 10 years.
- o Existing Quebec Street should be extended as a principal arterial from 56th Avenue north to tie into the Quebec Street/Vasquez Boulevard connection. This connection should be needed in phases from south to north in 10 to 20 years.

LANE REQUIREMENTS AND INTERSECTION RECOMMENDATIONS

The following recommendations are the result of the traffic analysis performed for the study corridors and all intersections.

- o 96th Avenue
 - Four-lane facility
 - Exclusive left turn lane at all intersections
 - Shared through-right turn lane at all intersections

- o Quebec Street/Vasquez Boulevard connection
 - Six-lane facility
 - Exclusive left turn lane at all intersections
 - Shared through-right turn lane at all intersections
- o Quebec Street/Quebec Street connection
 - Four-lane facility
 - Exclusive left turn lane at all intersections
 - Shared through-right turn lane at all intersections
- o Colorado Boulevard/York Street connection
 - Four-lane facility
 - Exclusive left turn lanes at all intersections
 - Shared through-right turn lane at all intersections

RECOMMENDED ALIGNMENTS

Based on the Alternative Alignment Analysis, a recommended alignment was identified for each of the study corridors. The recommended alignments are listed below and are shown on the figures in Section 5 of this report.

<u>Corridor</u>	<u>Recommended Alignment</u>
96th Avenue	1A-2C
Quebec Street/Vasquez Boulevard	1A-2A
Quebec Street/Quebec Street	1A-2A-3A Modified- 4A Modified
Colorado Boulevard/York Street	1B-2B

IMPLEMENTATION PROGRAM

To implement the recommendations of this study, a process consisting of the following steps should be pursued by Adams County, Commerce City, and the City of Thornton:

- o Obtain adoption of this final study report by the Adams County Commissioners and the City Councils of Commerce City and the City of Thornton
- o Pursue modification of the Denver Regional Council of Government's (DRCOG) Regional Plan to include the recommendations of this report
- o Coordinate with Colorado Department of Highways (CDOH) for improvements that interface with or are included in the state highway system
- o Coordinate with Urban Drainage and Flood Control District for South Platte River and tributary crossings
- o Identify funding sources for improvements
- o Adopt policies for right-of-way acquisition

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Section 1

Introduction

Section 1 INTRODUCTION

BACKGROUND

Adams County, Commerce City, and the City of Thornton have identified the need for regional transportation planning to establish an integrated transportation network throughout their communities. To accomplish this, the three parties contracted with CH2M HILL for this study to examine the transportation needs of the developing areas along the South Platte River between 120th Avenue and I-270. Specific roadway links studied in detail included the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, and Colorado Boulevard/York Street corridors.

STUDY AREA

The overall study area lies between the boundaries of 120th Avenue on the north, I-270 on the south, York Street on the west, and Peoria Street on the east, and is located in portions of Commerce City, Thornton, and Adams County, Colorado. Within each of the four roadway corridors studied, a smaller area was defined in which feasible alignment alternatives could be identified.

PURPOSE AND SCOPE

The primary goal of this study was to recommend a feasible alignment for each of the four study corridors so that the ultimate right-of-way needs can be determined. Conceptual alignments and opinions of cost for comparison purposes were developed during alternative alignment evaluations. During

preliminary and final design phases for the corridors, further work will be necessary to finalize the layouts and costs presented in this study.

The study included the following major tasks:

- o Data Collection
- o Transportation System Analysis
- o Typical Section Identification
- o Alternative Alignment Analysis

The Data Collection task consisted of collecting and reviewing copies of previously prepared transportation studies, available utility information, master drainage reports, property ownership information, and designated recreation and parks/open space locations.

The Transportation System Analysis task involved the preparation of the year 2010 traffic volume forecasts for the study area corridors. The basis of this work was previous studies completed for the study area. No additional traffic modeling work was performed. This task also included the development of turning movement volumes at key intersections and calculation of level of service (LOS).

The Typical Section Identification task consisted of determining the laneage requirements for the study corridors at an LOS of C or better. As part of this task, the general right-of-way widths for an "ultimate" or buildout scenario were developed for each corridor.

The Alternative Alignments Analysis task consisted of developing a set of feasible alignment alternatives for each study corridor, evaluating these alignments based on a criteria matrix, and recommending the most feasible alignment

for each corridor. This task consisted of the following major subtasks:

- o Formulation of conceptual roadway design standards by compiling applicable criteria of the American Association of State Highway and Transportation Officials (AASHTO), Colorado Department of Highways (CDOH), Adams County, Commerce City, and the City of Thornton.
- o Review of manmade or topographical constraints including residences in the study corridors.
- o Preparation of conceptual horizontal alignment layouts for each alignment alternative at a scale of 1"=400' on aerial photograph bases.
- o Preparation of 1"=100' interchange/intersection geometric drawings at key locations.
- o Preparation of conceptual profiles at interchange locations.
- o Identification of the structural considerations of river crossings and interchanges.
- o Identification of hydrologic/hydraulic considerations of river and major drainageway crossings.
- o Preparation of conceptual cost opinions for the alternative alignments for evaluation and comparison purposes.
- o Identification of approximate right-of-way requirements for each alignment alternative.

- o Identification of wetlands/wildlife and recreation impacts or benefits of the alignment alternatives.
- o Evaluation of the alternative alignments based on criteria developed for this study using a computer spreadsheet evaluation matrix.

Section 2

Transportation System Analysis

Section 2
TRANSPORTATION SYSTEM ANALYSIS

INTRODUCTION

The Transportation System Analysis task involved three primary elements: transportation system planning, traffic analysis, and identification of intersection geometrics.

The purpose of this section is to summarize study methodologies, key findings, conclusions, and recommendations. The recommendations of this section will serve as the basis for the alternative alignment analysis for the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, and Colorado Boulevard/York Street corridors.

TRANSPORTATION SYSTEM PLANNING

The intent of this planning effort was to identify the roadway needs within the study corridors. The study corridors include 96th Avenue between approximately Colorado Boulevard and Peoria Street, Quebec Street between 120th Avenue and I-270, and a new connection of Colorado Boulevard and York Street between 88th Avenue and I-270.

Roadway lane needs and intersection operations analyses are based on the year 2010 traffic volume forecasts. The long-range transportation demands that can be expected from an area buildout scenario were given consideration in defining right-of-way needs.

The first task of the Transportation System Planning task effort was the review of previous studies relevant to the area. Information concerning existing traffic volumes, traffic volume forecasts, roadway network configurations, and lane needs were compiled. The traffic volume forecasts were compared with consideration for the assumptions made in each report. A set of preliminary traffic volume forecasts for the year 2010 was then developed for the following three roadway system scenarios for Quebec Street:

1. Denver Regional Council of Government's (DRCOG) model run for the year 2010 that has a major direct connection between Quebec Street on the north and Vasquez Boulevard on the south.
2. DRCOG's 2010 model run with a major direct connection between Quebec Street on the north and Quebec Street instead of Vasquez Boulevard on the south.
3. DRCOG's 2010 model run that has a major direct connection between Quebec Street on the north and Vasquez Boulevard on the south, and a minor connection between Quebec Street on the north and Quebec Street on the south.

Based on the year 2010 raw forecast data for the three alternative scenarios, a set of preliminary recommendations was prepared and reviewed with the study Project Managers, representing Adams County, Commerce City, the City of Thornton, and representatives from DRCOG. After the review comments were received, the study forecasts and system recommendations were modified as appropriate and incorporated into this section.

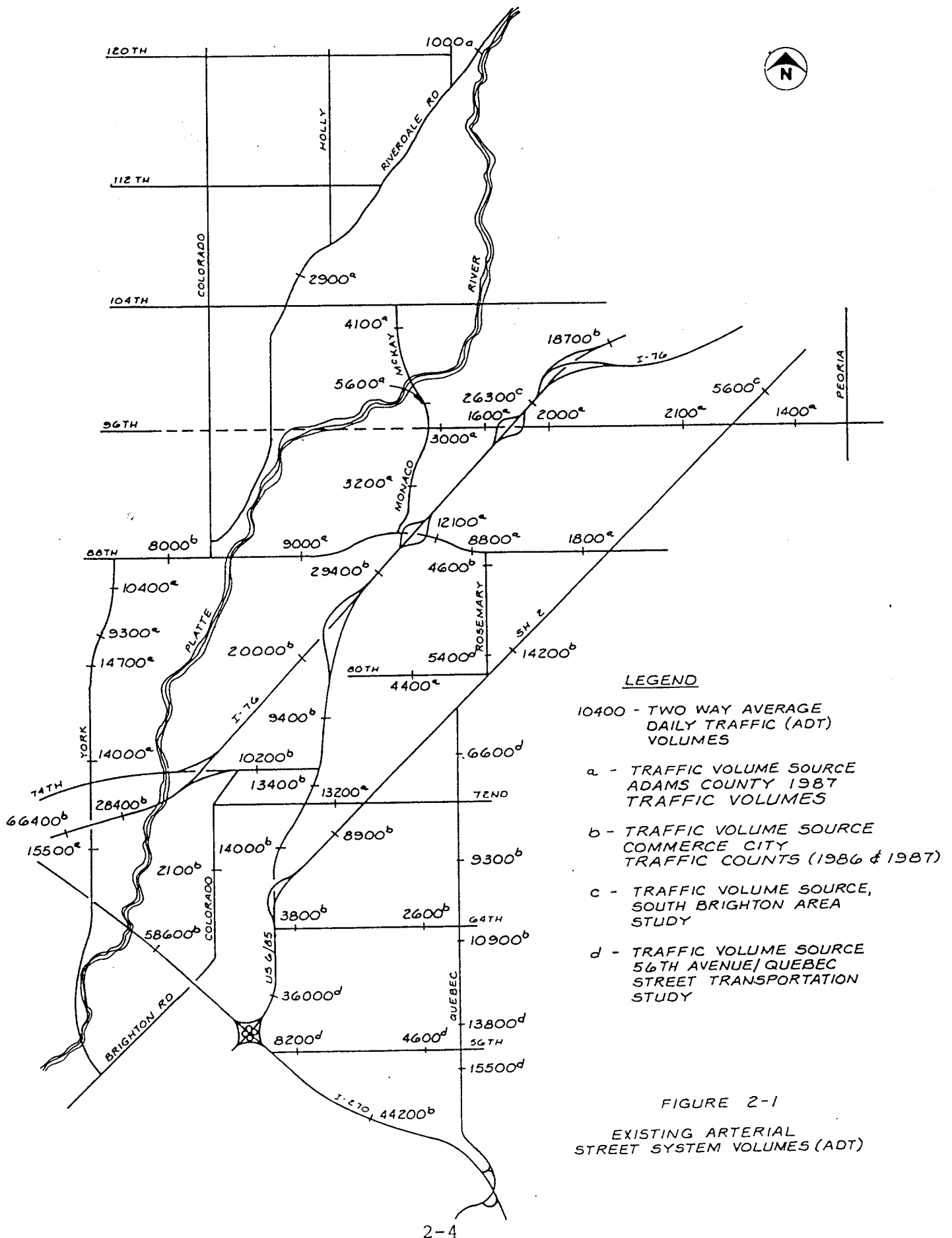
TRAFFIC VOLUME FORECASTS

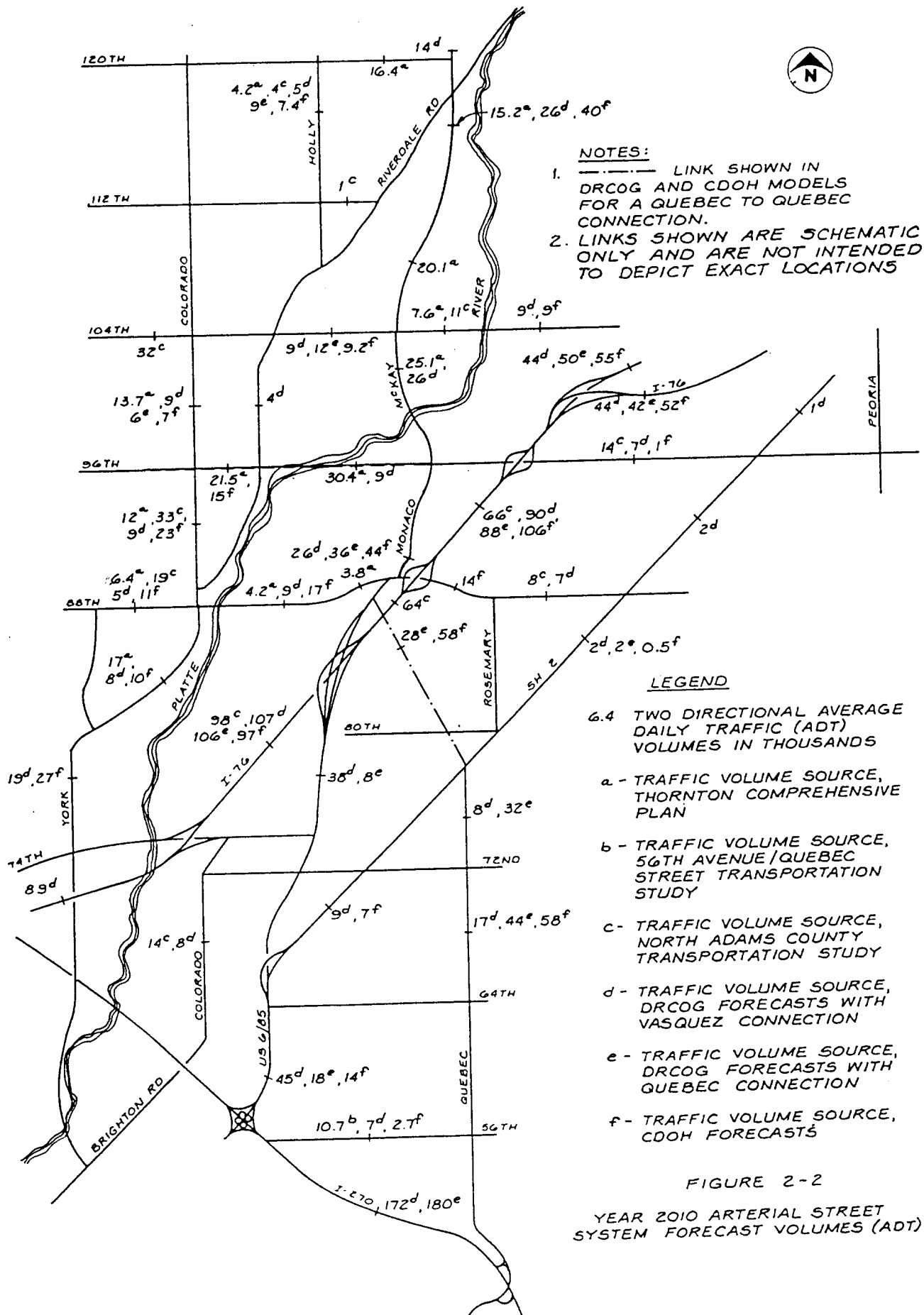
The traffic volume forecasts of this study are based on existing traffic volume data and on the traffic forecasting efforts from the following previous studies:

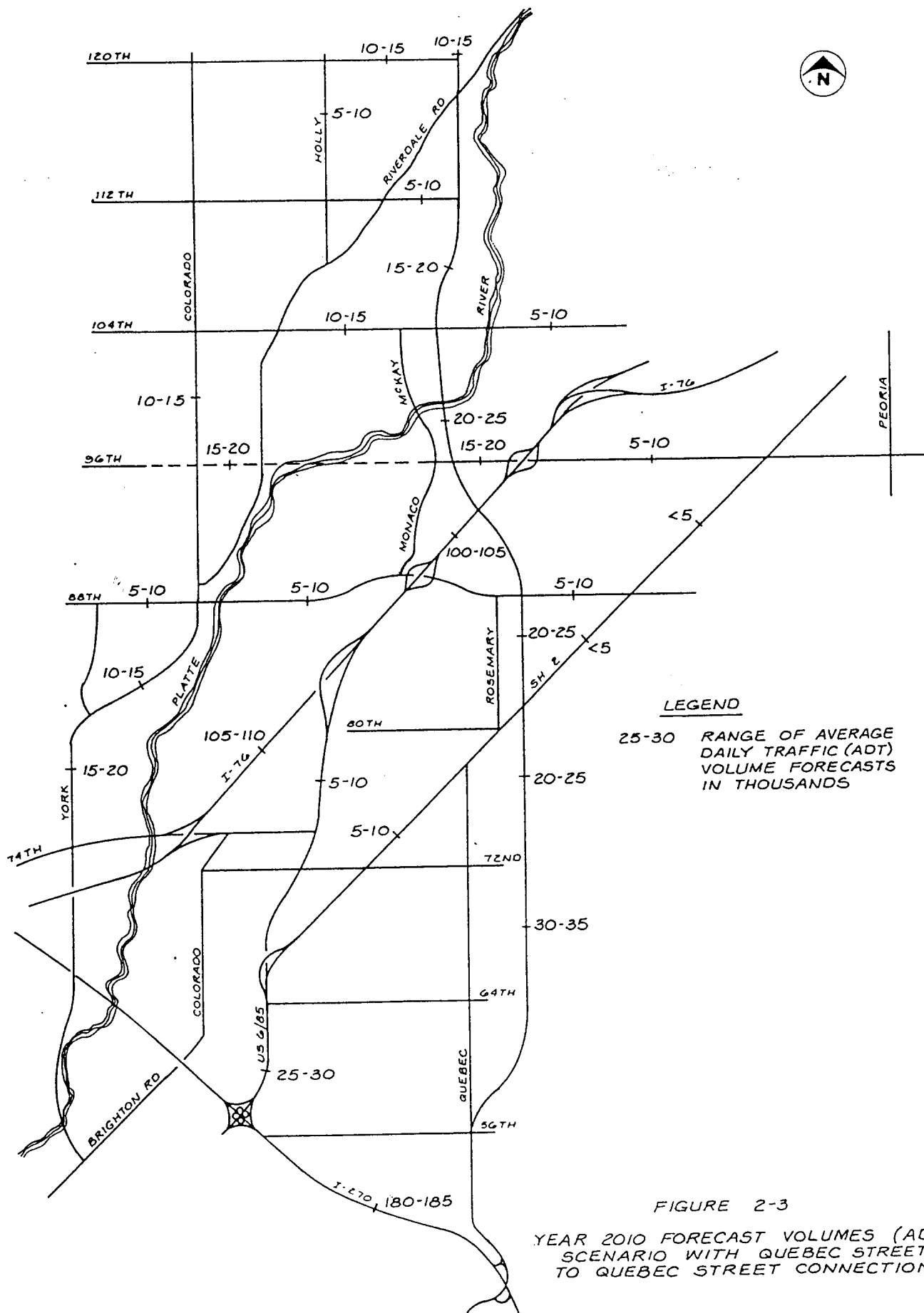
- o DRCOG Regional 2010 Transportation Plan
- o City of Thornton Comprehensive Plan
- o Commerce City Comprehensive Plan
- o DRCOG North Adams County Transportation Study
- o 56th Avenue/Quebec Street Transportation Study
(Commerce City, June 1987)
- o DRCOG Alternative Network Model Runs

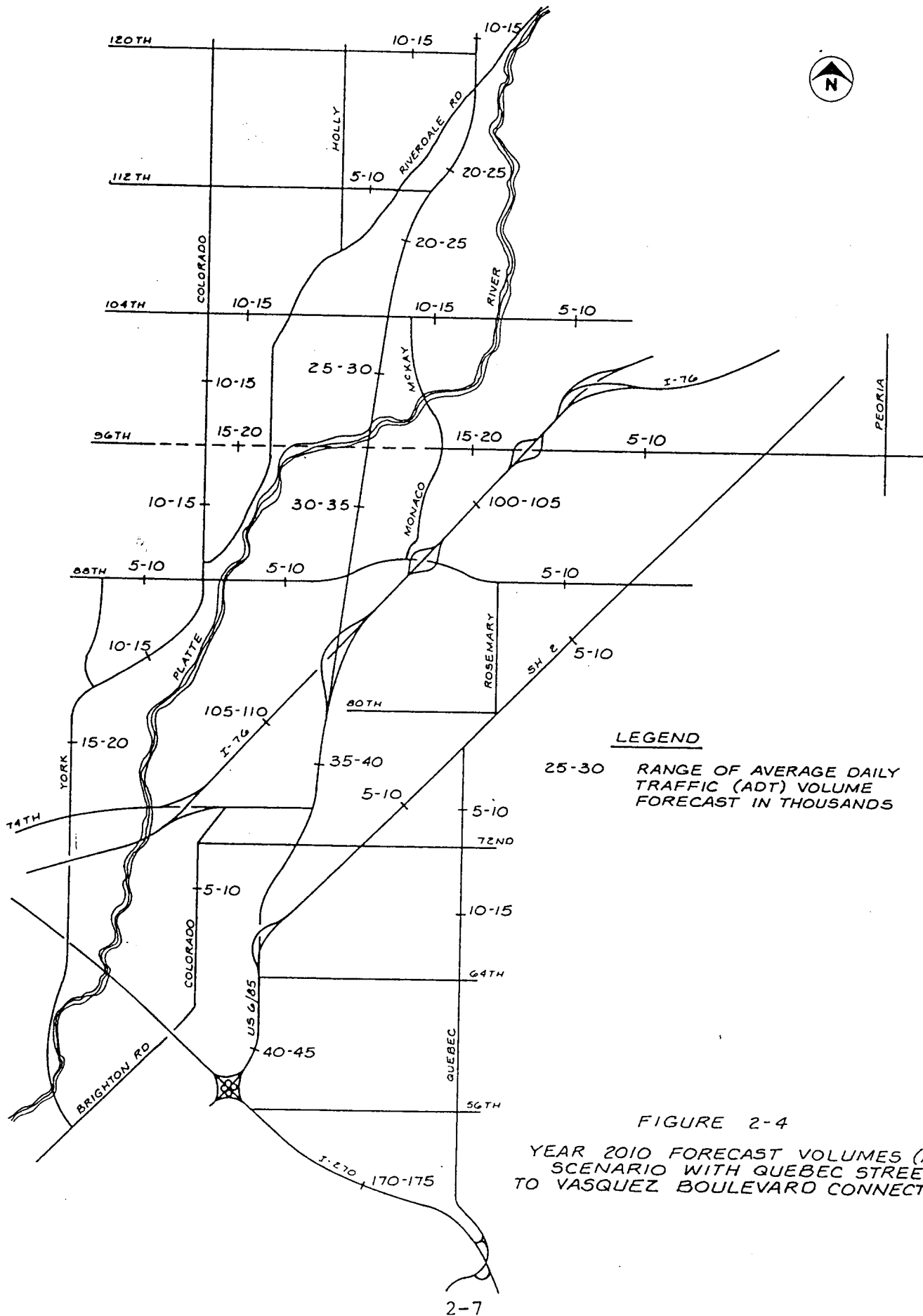
The information from these sources was adjusted where major conflicts occurred. These adjustments were based on land use and roadway system assumptions. Because sufficient modeling of alternative roadway systems was available, there was no need for additional traffic forecast modeling as a part of this study.

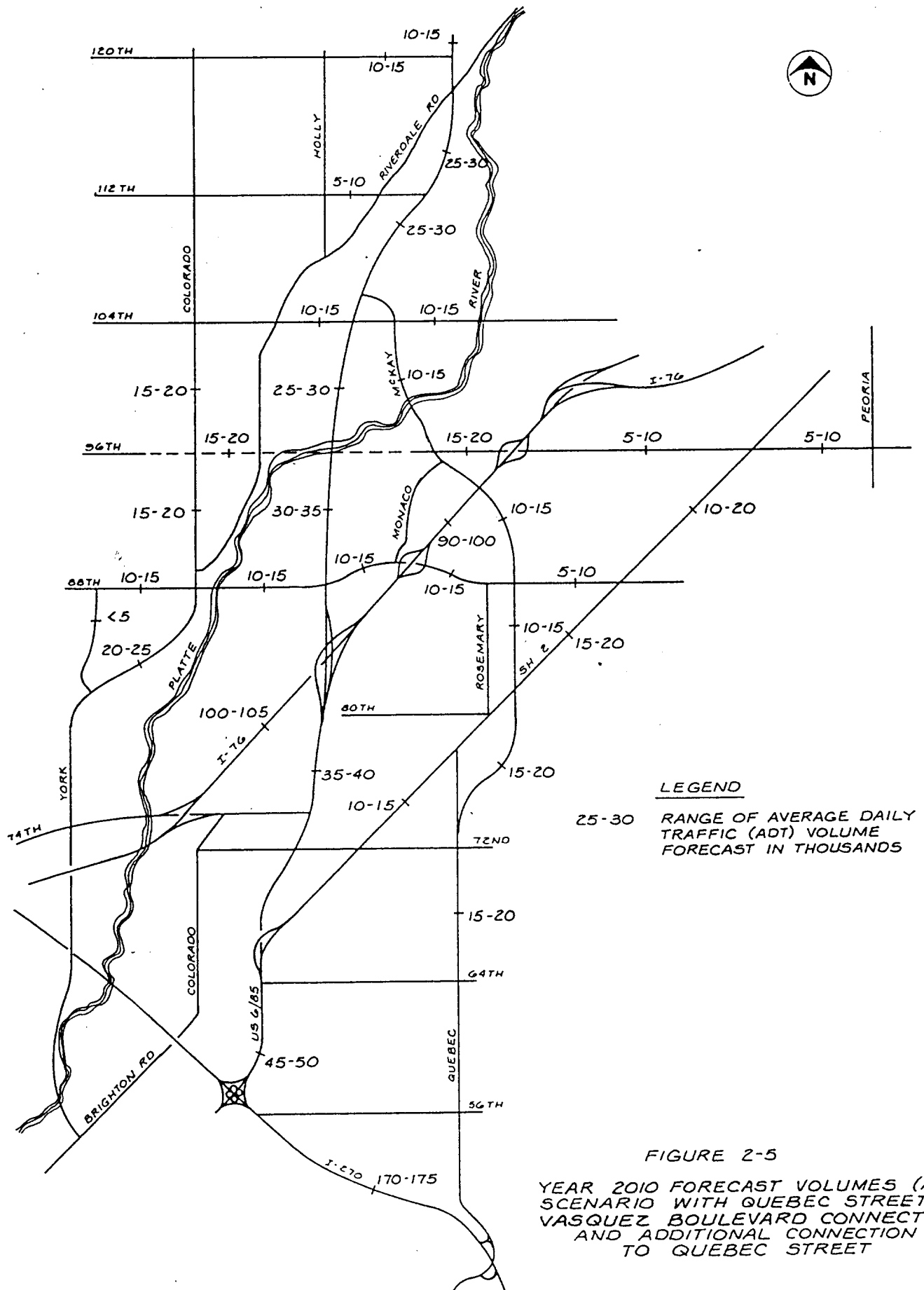
Figure 2-1 shows a summary of existing arterial street system volumes, and Figure 2-2 shows the forecast volumes of available study sources. Figures 2-3, 2-4, and 2-5 show the year 2010 forecast volumes for the three alternative roadway system scenarios described for Quebec Street. As indicated, the primary source of these volumes was alternative DRCOG year 2010 roadway system model runs.











ROADWAY SYSTEM ANALYSIS

The differences between the previous studies were because of differing land use and roadway system assumptions. Because the differences in land use assumptions were minor, no specific changes were made to traffic volumes for that reason.

Different assumptions in the roadway system were the primary reason for discrepancies between projected traffic volumes in the DRCOG North Adams County Transportation Study and the other studies. The primary difference is that the North Adams County Transportation Study does not include a regional facility that connects Quebec Street on the north to Vasquez Boulevard or Quebec Street on the south, whereas the other studies do. As a result, the forecasted volumes on Colorado Boulevard were higher in the North Adams County Transportation Study than in the other studies.

A brief description of the two types of arterial roadways addressed by this study are given below.

- o Principal Arterials--These facilities are major street or high capacity highways, primarily for through traffic. Access to adjacent property is a secondary function of principal arterials, and they are continuous through the entire Denver metropolitan area. Principal arterials typically form boundaries between different land uses or natural topographical features. Intersections are at-grade with minimum cross-street spacing between 1/8 and 1/2 mile. Speeds vary in urban areas between 25 and 40 miles per hour (mph).
- o Regional Arterials--These facilities provide for high through traffic volumes with minimal access to adjacent property. The location and design of

these roadways should recognize local constraints and be consistent with local goals. Access to adjacent property is allowed as right in/right out with primary access provided from side streets. Intersections with other roadways may be at-grade or grade separated interchanges. Minimum cross-street spacing for regional arterials should be between 1/2 and 1 mile, and speeds may vary between 45 and 55 mph.

96th Avenue Corridor

Within the study area, 96th Avenue is not presently constructed between Colorado Boulevard and McKay Road. Traffic volume forecasts for the year 2010 indicate that this connection will carry between 15,000 and 20,000 vehicles per day through this unconnected portion. Volumes are expected to be between 5,000 and 10,000 vehicles per day east of I-76. The reason that more traffic is projected on 96th Avenue west of I-76 than to the east is that more development is expected west of I-76. This means that the traffic west of I-76 will be local traffic in addition to traffic going to the airport, while traffic east of I-76 will primarily be airport-oriented traffic.

Traffic volumes are not as high as may be expected with the proposed connection of 96th Avenue from Colorado Boulevard, across the South Platte River to the new airport because of the following:

- o The area along 96th Avenue is not expected to be built out by the year 2010.
- o Other local river crossings exist and one other river crossing is planned to provide access to the new airport. River crossings presently exist on

88th Avenue, McKay Road, 104th Avenue, and Henderson Road. An additional crossing is planned at 120th Avenue. Two other connections to the new airport are planned for 104th Avenue and 120th Avenue.

Based on the year 2010 traffic forecasts, 96th Avenue should be extended across the Platte River as a principal arterial street to service local traffic and provide access to the new airport.

Quebec Street Corridor

Various model runs made by DRCOG are the source of the traffic volume forecast information for alternative connections between Quebec Street on the north and Quebec Street and/or Vasquez Boulevard on the south. The raw model run output was modified to better reflect existing conditions and the model's over-use of I-270. This modification reflects higher traffic volumes on the Quebec Street to Vasquez Boulevard connection than on the Quebec Street to Quebec Street alternative.

Based on these modified model run outputs, an evaluation was completed indicating that a higher regional demand exists for a connection between Quebec Street on the north and Vasquez Boulevard on the south than between Quebec Street on the north and Quebec Street on the south. This conclusion does not preclude the need for Quebec Street to be extended north of State Highway 2 (SH 2). An additional roadway should be added to the regional plan that would connect Quebec Street near 120th Avenue to Quebec Street south of SH 2 for the following reasons:

- o To serve as an additional north/south arterial street that will help complete a local roadway

street system with 1 to 1-1/2 mile spacing between roadways.

- o To serve traffic demands to the redeveloped Stapleton Airport beyond the year 2010.
- o To relieve the Quebec Street/Vasquez Boulevard connection traffic beyond the year 2010.
- o To serve potential development and redevelopment on Quebec Street between I-270 and SH 2.

It should be noted that the portion of the Quebec Street/Quebec Street connection north of 96th Avenue will be the most expensive section to construct since it crosses the South Platte River flood plain. Because of this expense, the need for the Quebec Street/Quebec Street roadway north of 96th Avenue should be reevaluated as development occurs in that area.

Colorado Boulevard/York Street Corridor

The Colorado Boulevard/York Street corridor already has significant traffic demands on York Street south of 88th Avenue. These demands are consistent with future volume forecasts and confirm the need for a direct connection of Colorado Boulevard to York Street south of 88th Avenue.

Phasing

Implementation of the needed roadway improvements previously identified should be phased according to their relative traffic demands. The approach of this study to phasing improvements is based on servicing existing demands first and providing for future demands next.

Since the Colorado Boulevard/York Street corridor has higher existing demands along its complete length than any of the other study area corridors, and since it will also serve as a minor north/south roadway parallel to the Quebec Street to Vasquez Boulevard connection, it should be constructed first.

The Quebec Street to Vasquez Boulevard connection should be constructed second because it will have a higher regional demand than the other study area corridors. The Quebec Street to Vasquez Boulevard connection will also help relieve the need for other minor roadway improvements within the local area not addressed in this study.

The 96th Avenue improvements should be constructed after the Quebec Street to Vasquez Boulevard connection because two other parallel Platte River crossings presently exist 1 mile to the south at 88th Avenue and 1 mile to the north at 104th Avenue. Traffic demands on 96th Avenue should increase more rapidly than on the other parallel roadways because 96th Avenue is designated to be the first route to the new airport north of the Rocky Mountain Arsenal. The presently planned 96th Avenue access to the new airport will be primarily for cargo and employees. However, 96th Avenue will connect to E-470 and provide indirect passenger access to the airport.

The Quebec Street to Quebec Street connection should be the last roadway improvement constructed because it will serve long-range development. The construction of this connection should be considered in phases from south to north as development moves north through the study area. Logical sections for construction phasing are 56th Avenue to SH 2, SH 2 to 88th Avenue, 88th Avenue to 96th Avenue, and 96th Avenue to 120th Avenue.

ROADWAY SYSTEM RECOMMENDATIONS

The primary recommendations for the study area roadway system are listed below in their relative order of priority. An expected timeframe of need is given based on the year 2010 traffic demands.

- o Colorado Boulevard should be extended as a principal arterial south from 88th Avenue and connected to York Street north of SH 224. There is an existing need for this connection.
- o Quebec Street should be extended as a regional arterial south from 120th Avenue to connect with Vasquez Boulevard at US 85. This connection should be needed in 5 to 10 years.
- o 96th Avenue should be extended as a principal arterial across the Platte River to provide access for the new airport. This connection should be needed in 5 to 10 years.
- o Existing Quebec Street should be extended as a principal arterial from 56th Avenue north to tie into the Quebec Street/Vasquez Boulevard connection. This connection should be needed in phases from south to north in 10 to 20 years.

TRAFFIC ANALYSIS

The purpose of this traffic analysis was to identify the number of lanes required to meet the forecasted traffic demands. The analysis assessed the forecasted volumes along roadway sections and the sum of the critical volumes at key intersections. To determine the lane requirements along the

roadway sections and at the intersections, the planning method described in the 1985 Highway Capacity Manual was used.

The first task was to determine the number of lanes required for the through sections of road. To make this determination, the average daily traffic (ADT) volumes, which were developed in the Transportation System Planning task discussed in this section, were used as input into the planning method for multilane highways. This method was chosen because the roadways in the study corridors lack full control of access; however, in the year 2010, these roadways will operate under uninterrupted flow conditions between points of fixed interruptions.

This planning methodology assumes that ideal roadway geometrics exist and that traffic streams consist only of passenger cars and trucks, but not significant numbers of buses. The general computational approach in this analysis is to convert the design year average annual daily traffic (AADT) to a directional design hour volume (DDHV), and apply environmental factors to find the required number of lanes. Table 2-1 shows the DRCOG planning volumes that were used.

Table 2-1
DRCOG PLANNING VOLUMES

<u>Facility</u>	<u>Vehicles per Lane</u>
Four-lane principal arterial	880
Major regional arterial	1,100

The second task was to analyze intersection operations and determine the number and configuration of lanes to meet the

demands. Because intersections are designed to accommodate the peak-hour demands, the ADT volumes were converted into p.m. peak-hour volumes, and finally turning movement volumes were calculated.

To calculate the design hour volumes, the following factors were assumed and confirmed with DRCOG, Adams County, Thornton, and Commerce City. The directional split of traffic was assumed to be 55 percent north, 45 percent south, 50 percent east, and 50 percent west. The percent of the ADT occurring during the p.m. peak was assumed to be 10, and the turning movements were assumed to be 40 percent of the total traffic, with 20 percent right turns and 20 percent left turns.

The basic input for intersection analysis consists of demand volumes and intersection geometrics. Demand volumes were calculated as described above, and intersection geometrics were assumed based on the roadway section lane requirements for the study streets and review of previous studies and comprehensive plans. The inputs result in the sum of critical lane volumes, which indicate the capacity sufficiency of the intersection.

Two primary intersection configurations were identified during the traffic analysis that will maintain adequate operations at key intersections through the year 2010. Figure 2-6 shows these intersection configurations. A type A intersection has, on all four approach legs, a left turn pocket, one exclusive through lane, and one shared through-right turn lane. While type B intersections are similar to type A on the minor approach, the major approach legs have one left turn lane, two exclusive through lanes, and one shared through-right turn lane.

The above described methodologies were used on all the roadway corridors of this study.

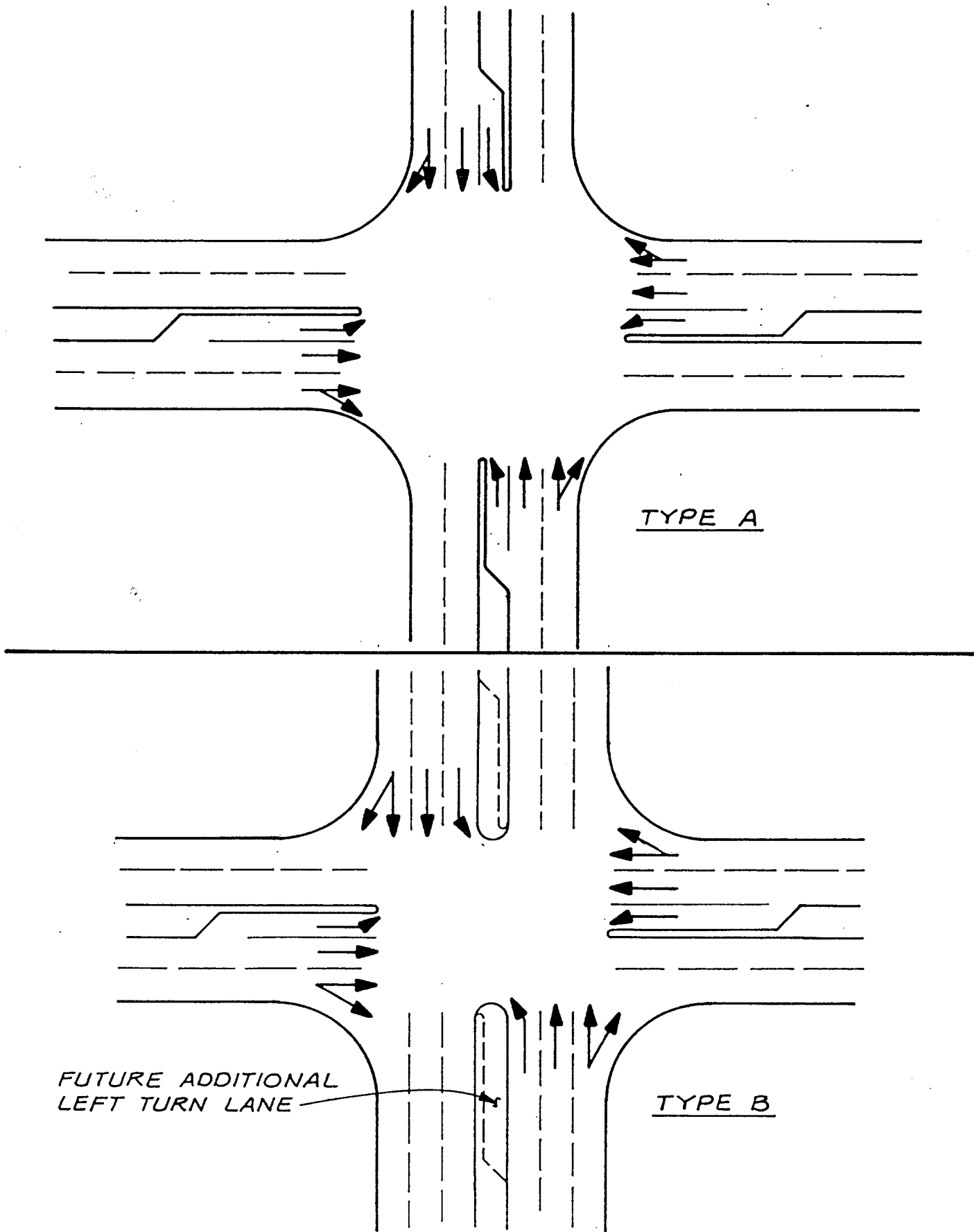


FIGURE 2-6

INTERSECTION GEOMETRICS

96th Avenue

Principal arterials are major roadways through cities and counties. They are continuous outside the local area, and they intersect regional arterials and principal arterial facilities, thereby providing transportation continuity. The east/west 96th Avenue corridor is planned to be a principal arterial in the City of Thornton.

In Adams County and Commerce City, the 96th Avenue corridor is planned as an expressway east of I-76. As an expressway, it would serve through traffic at higher speeds than a principal arterial and it would have greater spacing between intersections and/or interchanges.

Presently, 96th Avenue is located along the northern edge of the Rocky Mountain Arsenal. It is continuous to the eastern boundary of the study area at Peoria Street. Moving westward, it has an interchange at I-76, and terminates on the west at McKay Road. Although 96th Avenue does not presently exist within the west and central portion of the study area, it does exist to the west of Colorado Boulevard and provides access to areas west of the study area. One goal of this study is to recommend an alignment to connect the existing portions of 96th Avenue, thus completing this east/west arterial facility within the study area.

The ADT forecast volumes used for the traffic analysis on 96th Avenue assume the regional continuity of this roadway. ADT forecasts range from 5,000 to 20,000 vehicles along 96th Avenue, with the higher volumes west of the I-76 interchange.

The analysis indicated the need for 1.5 through lanes in each direction at an LOS of D. Because two through lanes in each direction must be constructed, further analysis showed

an actual LOS of C will be experienced in the design year 2010.

The analysis of intersections along 96th Avenue resulted in both Type A and B intersections. The peak-hour turning volumes ranged from 90 to 385 vehicles per hour. The analysis indicated that all intersections along 96th Avenue operate near or above capacity with one left turn lane and a shared through-right turn lane. Turning movement volumes for each intersection analyzed are provided under separate cover from this report. Figure 2-7 shows the type and capacity level for each intersection.

Quebec Street/Vasquez Boulevard

The Quebec Street/Vasquez Boulevard connection is the major regional north/south facility proposed to meet future traffic demands from the study area to metropolitan Denver.

This facility has high forecasted ADT demands ranging from 25,000 vehicles north of 96th Avenue to 50,000 vehicles where the connection with US 6/85 is made. These forecasts indicate that this facility will be a north-south regional arterial within the study area.

Analysis of the through lane needs on the Quebec Street/Vasquez Boulevard connection indicates that 2.1 through lanes are required in each direction to obtain an LOS of D. Therefore, three through lanes in each direction are desirable to maintain adequate operations. However, the additional capacity of three lanes will result in an actual LOS of C during the design year.

Since the Quebec Street/Vasquez Boulevard connection will require three through lanes, all intersections along the roadway will be type B. The intersection peak-hour turning

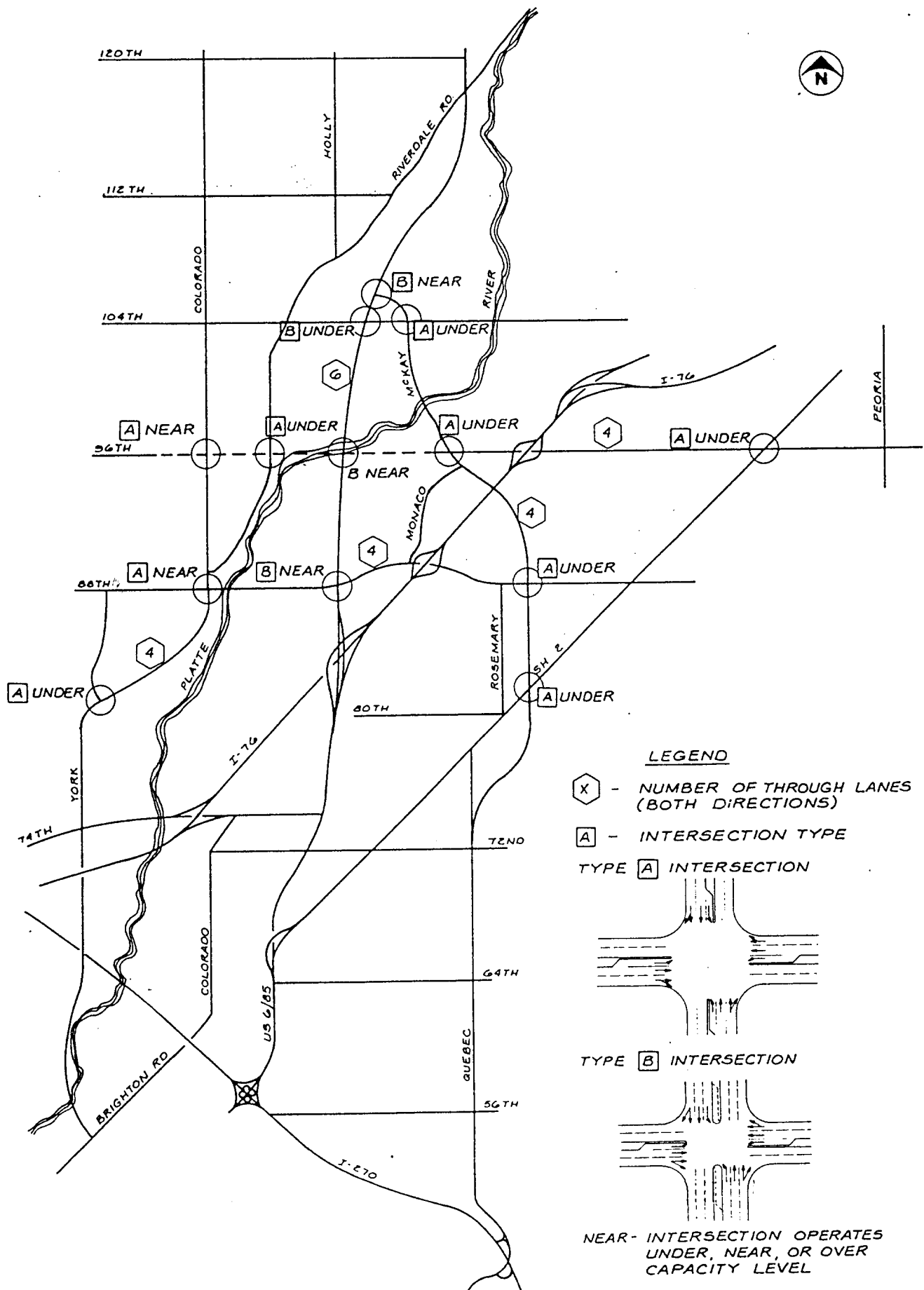


FIGURE 2-7
RESULTS OF TRAFFIC ANALYSIS

movement volumes range from 270 to 440 vehicles per hour. The turning movement volumes used for the analysis of each intersection are provided under separate cover from this report.

Results of the intersection analysis indicate that all intersections operate under or near capacity. Figure 2-7 shows these results.

Quebec Street/Quebec Street

The additional Quebec Street to Quebec Street connection was also analyzed for lane requirements and intersection layouts. Quebec Street will be a principal arterial throughout the study area.

The ADT forecasts range from 10,000 to 20,000 vehicles along this eastern Quebec Street connection. These volumes are similar to 96th Avenue, and again the lane requirements to maintain LOS of D are two lanes in each direction.

Intersection turning movement volumes and analysis are provided under a separate cover from this report. Because of the lane requirements on Quebec Street, the analysis indicates that all intersections are type A and operate at a level under capacity. Figure 2-7 indicates the individual results for these intersections.

Colorado Boulevard/York Street

Both Colorado Boulevard and York Street are discontinuous at 88th Avenue within the study area. Because of the Platte River alignment within this area, few alternative routes for north-south roadways are available. The proposed Colorado Boulevard/York Street connection would provide yet another

north-south connection and would provide regional access to the south.

Assuming this connection, the forecasted ADT volumes range from 10,000 to 25,000 vehicles. The 10,000-vehicle ADT forecast occurs north of 112th Avenue, and the 25,000-vehicle forecast occurs south of 88th Avenue. Fifteen thousand vehicles were used for the through lane needs analysis. The analysis indicates a need for 1.1 lanes in each direction to maintain an LOS of D and 1.4 lanes in each direction for an LOS of C. This analysis also indicates that where volumes are higher, within the 25,000-vehicle range, two through lanes in each direction will still operate at an LOS of D. Based on this analysis, two lanes in each direction are recommended for the Colorado Boulevard/York Street corridor.

Again, the turning movement volumes were calculated using the assumed directional splits. These volumes are provided under a separate cover from this report for all of the intersections along the Colorado Boulevard/York Street corridor. All intersections along this roadway are type A and operate near or under capacity. Figure 2-7 indicates the type and capacity level of each intersection.

TRAFFIC ANALYSIS SUMMARY OF RECOMMENDATIONS

The analysis performed on all study corridors and at each intersection results in the following recommendations:

- o 96th Avenue
 - Four-lane facility
 - Exclusive left turn lane at all intersections

- Shared through-right turn lane at all intersections
- o Quebec Street/Vasquez Boulevard Connection
 - Six-lane facility
 - Exclusive left turn lane at all intersections
 - Shared through-right turn lane at all intersections
- o Quebec Street/Quebec Street Connection
 - Four-lane facility
 - Exclusive left turn lane at all intersections
 - Shared through-right turn lane at all intersections
- o Colorado Boulevard/York Street Connection
 - Four-lane facility
 - Exclusive left turn lanes at all intersections
 - Shared through-right turn lane at all intersections

Section 3
Design Criteria and Typical Sections

Section 3
DESIGN CRITERIA AND TYPICAL SECTIONS

INTRODUCTION

The purpose of this section is to summarize the roadway design criteria and recommended typical sections for the study corridors. The standards developed for this study are a compilation of applicable criteria of Adams County, Commerce City, the City of Thornton, CDOH, and AASHTO. Laneage requirements are based on the traffic demands prepared during the Transportation System Analysis task of this study. The following describes roadway design criteria and typical sections.

TRAFFIC OPERATIONS--LOS OF C

The minimum desirable operating condition, or LOS, for expected traffic volumes during peak hours is an LOS of C through the year 2010. Since additional development will increase traffic demands after the study year, an LOS of C has been selected for planning instead of an LOS of D, even though an LOS of D is the minimum operating condition usually planned for in urban areas. Previous discussions in Section 2 indicate that LOS C will be met for the year 2010 with the recommended lanes and intersection configurations.

DESIGN SPEED--45 mph AND 40 mph

The 1984 AASHTO A Policy on Geometric Design of Highways and Streets indicates that arterial streets should be designed for speeds between 30 and 60 mph, depending on the number of

at-grade intersections and the amount of cross and turning traffic. Since the Quebec Street/Vasquez Boulevard connection is intended to carry regional traffic as well as serve local development, its design speeds should be 45 mph. Since the Quebec Street/Quebec Street connection, the Colorado Boulevard/York Street connection, and 96th Avenue will primarily serve area traffic and local development (although 96th Avenue will also carry regional traffic to the new airport), their design speeds should be 40 mph. These recommended design speeds are consistent with local traffic control practices.

LANE WIDTHS--12 FEET

The 1984 AASHTO policy states that 12-foot lanes are desirable on arterial streets. This width will provide for the maximum capacity, and help reduce accident potential. Based on the AASHTO guide and local standards, 12-foot through, left turn, and right turn lanes are recommended for conceptual design of the corridor alignments.

SIGNAL SPACING--1/2 AND 1/4 MILE

Given the regional traffic expected on the Quebec Street/Vasquez Boulevard connection, through traffic should be given special consideration. This means the impacts of traffic signals should be minimized by only allowing signals at approximately 1/2-mile locations. A 1/2-mile distance between signals will facilitate signal timing for speeds of 35 to 40 mph at cycle lengths of 90 to 105 seconds. Based on this, signal spacing on the Quebec Street/Vasquez Boulevard connection should be restricted to 1/2-mile locations. 96th Avenue will have less traffic than the Quebec Street/

Vasquez Boulevard connection, but will serve as a route to the new airport. Local development will also be serviced from 96th Avenue. Given these considerations, a 1/2-mile spacing between signals would be desirable, but not necessary. However, a minimum signal spacing of 1/4 mile should be maintained for adequate local circulation at speeds of 25 to 30 mph for cycle lengths of 60 to 80 seconds.

Since the Quebec Street/Quebec Street connection and Colorado Boulevard/York Street connection will primarily serve local area traffic and adjacent development, signal spacing for through traffic is not as important as on the other two study corridors. Since there will not be as high a percentage of through traffic, 1/4-mile signal spacing should be adequate for circulation. It should be noted that signal spacing less than 1/4 mile should not be permitted on the Quebec Street/Quebec Street connection because through traffic movements would be restricted.

GRADES--6 PERCENT MAXIMUM
AND 0.5 PERCENT MINIMUM

The CDOH Roadway Design Manual states that the maximum grade on flat terrain for a design speed of 45 mph is between 6 and 7 percent. However, the roadways in the study corridors are expected to have several at-grade intersections and other access locations. Because of the number of intersections as well as the existence of cold weather and icy conditions, 4 percent should be considered the desirable maximum grade, and 6 percent the absolute maximum grade where terrain is severe. Where intersections are expected, the maximum approach grade should be 3 percent.

The minimum grade to provide for drainage should be 0.5 percent.

SUPERELEVATION

Along most of their length, the study corridors are relatively straight. Where curves will be required, physical constraints such as driveways, cross streets, and drainage, may negate the practicality of superelevating the roadway. However, superelevation should be incorporated where possible. The desired maximum superelevation considered in the conceptual alternative layouts was 4 percent. The issue of superelevation should be addressed during preliminary engineering and final design.

MEDIAN--16-FOOT MINIMUM WIDTH

Raised medians should be provided along all of the study corridors to channelize traffic flow and control access. Medians can also provide various levels of landscaping to mitigate the aesthetic impacts of a roadway. The minimum width of 16 feet (face-of-curb to face-of-curb) allows for the safe development of left turn lanes at intersections.

WALKWAYS AND BIKEWAYS

Pedestrian traffic should be maintained along both sides of the study corridor roadways, and bicycle traffic should be maintained on at least one side of the study corridor roadways. To make these facilities safer, a 5-foot minimum (8-foot preferable) separation should be provided between traveled lanes, and pedestrian and bicycle ways. This separation will also provide an area for roadway signing, additional landscaping, and snow storage.

ACCESS

Full access to 96th Avenue, the Colorado Boulevard/York Street connection, the Quebec Street/Vasquez Boulevard connection, and the Quebec Street/Quebec Street connection, should be limited to 1/2-mile and 1/4-mile spacing where possible, and conform to the previously described guidelines for signal spacing. Right-in and right-out access should be permitted between signals at locations that will not impact intersection operations. Since it is not always possible to adequately service adjacent properties with 1/2-mile or 1/4-mile signal spacing, additional access measures should be pursued. This means a comprehensive access plan should be developed to incorporate the following measures.

- o. Minimize access points by consolidating entrances on property lines.
- o. Require developments to provide internal circulation that will allow through traffic movements. This calls for planning of minor streets that will connect several developments, rather than allowing developments to have local street systems that service only their property.
- o. Plan for local access roads where internal site circulation is not practical. These access roads should supplement a local minor street system by providing circulation between collector and minor arterial streets, as well as direct access to adjacent properties. Care must be taken when planning local access roads to minimize the potential impacts on arterials because of close intersection spacing.

TYPICAL SECTIONS--155 AND 220 FEET

Typical roadway sections were developed to service traffic demands through the year 2010 for the study corridors. The sections are composed of six main elements: number of through and turning lanes, raised median, buffer area between travel lanes and pedestrians, walkways/bikeways, transition area to the right-of-way boundary, and consideration for additional lane needs after the year 2010. The specific typical sections and their elements are discussed below.

QUEBEC STREET/VASQUEZ BOULEVARD CONNECTION

The recommended right-of-way width for the Quebec Street/Vasquez Boulevard roadway section at intersections and access locations is 220 feet. This roadway should have a larger cross section than the other study corridor roadways because it will require more lanes and a wider transition area between the physical roadway and the right-of-way. The midblock roadway may be reduced to a narrower width where no turn lanes or acceleration-deceleration lanes for intersections and access points are required.

Right-of-way requirements are based on conceptual level design details. Final right-of-way requirements could be reduced or increased during preliminary engineering and final design if physical conditions are different than those assumed during this study.

The recommended typical section for intersection approaches and access locations for Quebec Street/Vasquez Boulevard are shown on Figure 3-1, Regional Arterial, Six Lanes.

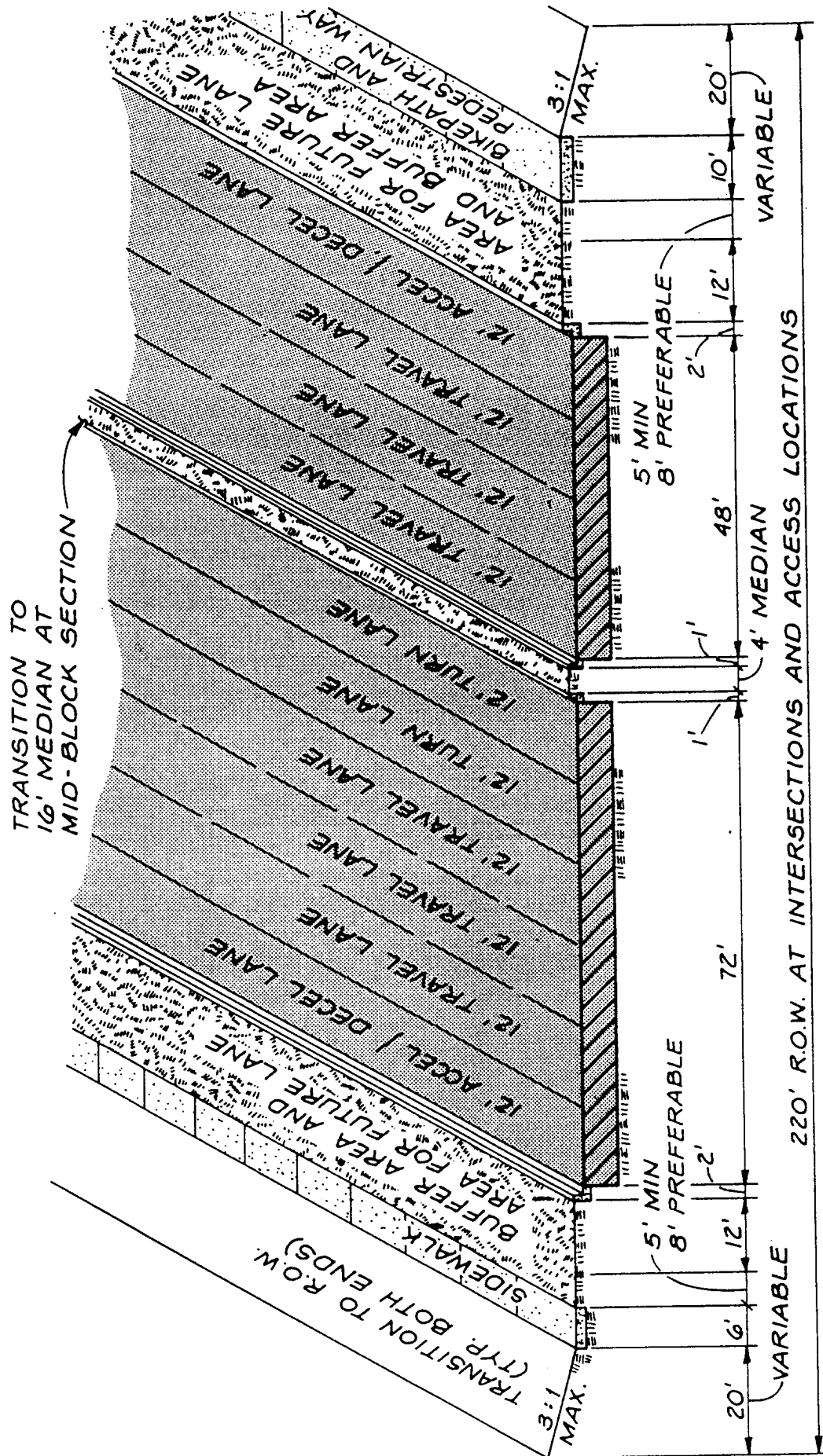


FIGURE 3-1

REGIONAL ARTERIAL 6 LANES
(8 LANES ULTIMATE)
QUEBEC STREET/VASQUEZ BOULEVARD
CONNECTION

96TH AVENUE, COLORADO BOULEVARD/
YORK STREET CONNECTION, AND QUEBEC
STREET/QUEBEC STREET CONNECTION

These three roadways will require the same number of lanes and service similar traffic. Therefore, their typical sections should be similar. The recommended right-of-way width for the roadway section at intersections and access locations for each corridor is 155 feet. The midblock roadway may be reduced to a narrower width where no turn lanes or acceleration-deceleration lanes for intersections and access points are required.

Similar to the Quebec Street/Vasquez Boulevard connection, the right-of-way requirements for 96th Avenue, the Colorado Boulevard/York Street connection, and the Quebec Street/Quebec Street connection are based on the conceptual level design detail of this study. Final right-of-way requirements could be reduced or increased during preliminary engineering and final design if physical conditions are different than those assumed during this study.

Given construction of the new airport, it may be desirable for 96th Avenue to be designed as a gateway into Commerce City and Adams County. This could be achieved by increasing the median width to 30 or 40 feet. This increased median width could allow for extensive landscaping and signing. The recommended typical section for the intersection approaches and access locations for 96th Avenue, the Quebec Street/Quebec Street connection, and the Colorado Boulevard/York Street connection is shown on Figure 3-2, Principal Arterial, Four Lanes.

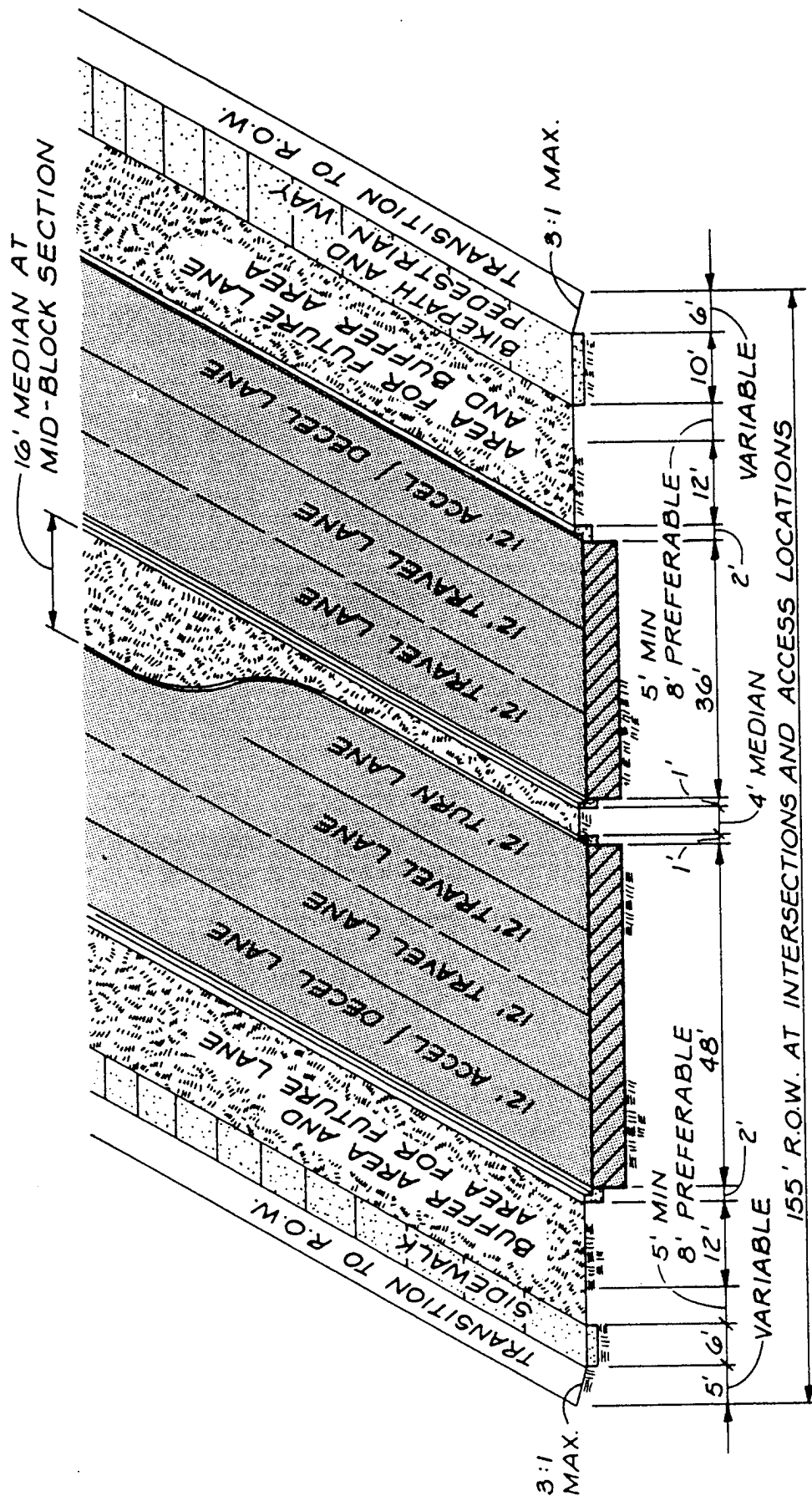


FIGURE 3-2

PRINCIPAL ARTERIAL 4 LANES
(6 LANES ULTIMATE)

96TH AVENUE
QUEBEC STREET/QUEBEC STREET
COLORADO BOULEVARD/YORK STREET
CONNECTIONS

Section 4
Alternative Alignment Analysis

Section 4
ALTERNATIVE ALIGNMENT ANALYSIS

INTRODUCTION

This section presents the alternative alignment analysis that has been completed for the study corridors. Previous sections describing the roadway transportation system analysis, typical roadway section needs, and design criteria used for this study are the basis for this alternative alignment analysis.

The analysis of alternative alignments for each study corridor was completed by identifying initial possible alternatives on maps at a scale of 1"=1,200', screening each possible alternative based on logical constraints, refining the feasible alternative alignments on maps at a scale of 1"=400', and evaluating each feasible alternative alignment on relative criteria.

Based on the transportation system analysis, the initial Quebec Street corridor was broken into two separate corridors: a Quebec Street/Vasquez Boulevard corridor and a Quebec Street/Quebec Street corridor. Alternative alignments were analyzed for the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, and Colorado Boulevard/York Street corridors.

The following portions of this section discuss identification and screening of initial alternative alignments, description of alternative alignments that were designated as feasible during the screening process, evaluation of feasible alternative alignments, and the recommended alignments in each corridor.

INITIAL ALTERNATIVE ALIGNMENT
IDENTIFICATION AND SCREENING

Alternative alignments were identified in locations where horizontal design criteria could be met without major impacts to existing developed areas. As the alternative alignment layouts were prepared, constraints that dictated logical roadway locations quickly became apparent. The primary constraints along each corridor that shaped the initial alignments included existing residential and commercial areas, the South Platte River, lakes and ponds, existing roadways and railroads, existing and planned major drainage-ways and structures, existing terrain, and approved development plats.

During the alternative alignment identification and screening effort, input was solicited and received at the Project Managers' Meetings attended by the representatives of the City of Thornton, Commerce City, Adams County, and CH2M HILL; and at the Technical Committee Meetings attended by the project managers and representatives of CDOH, Denver Regional Council of Governments, Urban Drainage and Flood Control District, and the Rocky Mountain Arsenal.

After a preliminary set of alternatives was prepared, alignment adjustments were made and additional alternatives were discussed. The initial alternatives in each corridor were screened, and recommended feasible alternatives were reviewed and approved by the project managers for more detailed analysis. The following discussions summarize the screening of initial alternative alignments.

96TH AVENUE

The initial alignment alternatives for 96th Avenue began where the roadway is planned to intersect Colorado

Boulevard. These alternatives were restricted in the middle of the study corridor by I-76, and they ended at Peoria Street on the east.

Between Colorado Boulevard and I-76, alternatives that went north of the North County Village mobile home subdivision were identified. However, these alternatives were eliminated from further consideration because to get back to the existing 96th Avenue interchange at I-76, these alternatives would cross a lake 20 to 30 feet deep or go through the South Adams County Wastewater Treatment Plant.

Presently, on the south side of 96th Avenue, an open area exists that would allow the road to be located away from the North County Village subdivision. This alternative would miss the south end of the lake where an alignment along 96th Avenue would go through. However, an approved gravel mining operation on Spratt-Platte Ranch may not be compatible with this alternative.

East of I-76 the existing alignment of 96th Avenue is bordered by several industrial and commercial properties. Because of the location of these developments, it is not feasible for an alignment to diverge from the existing 96th Avenue alignment until near the Burlington Ditch. In addition to the alternative along existing 96th Avenue, two additional alternative alignments were identified between the Burlington Ditch and SH 2. The first alternative curved to the north just west of the Burlington Ditch until it was approximately 1,200 feet north of 96th Avenue. It then continued east, crossed SH 2, and ended at Peoria Street. The second alternative curved north between the O'Brian Canal and SH 2, and also crossed SH 2 approximately 1,200 feet north of existing 96th Avenue. East of SH 2 these two alternatives coincided and were located approximately 1,200 feet

north of existing 96th Avenue to fall on existing property lines. This would allow development to occur on both sides of the roadway. Development will not likely occur south of existing 96th Avenue where the Rocky Mountain Arsenal is located.

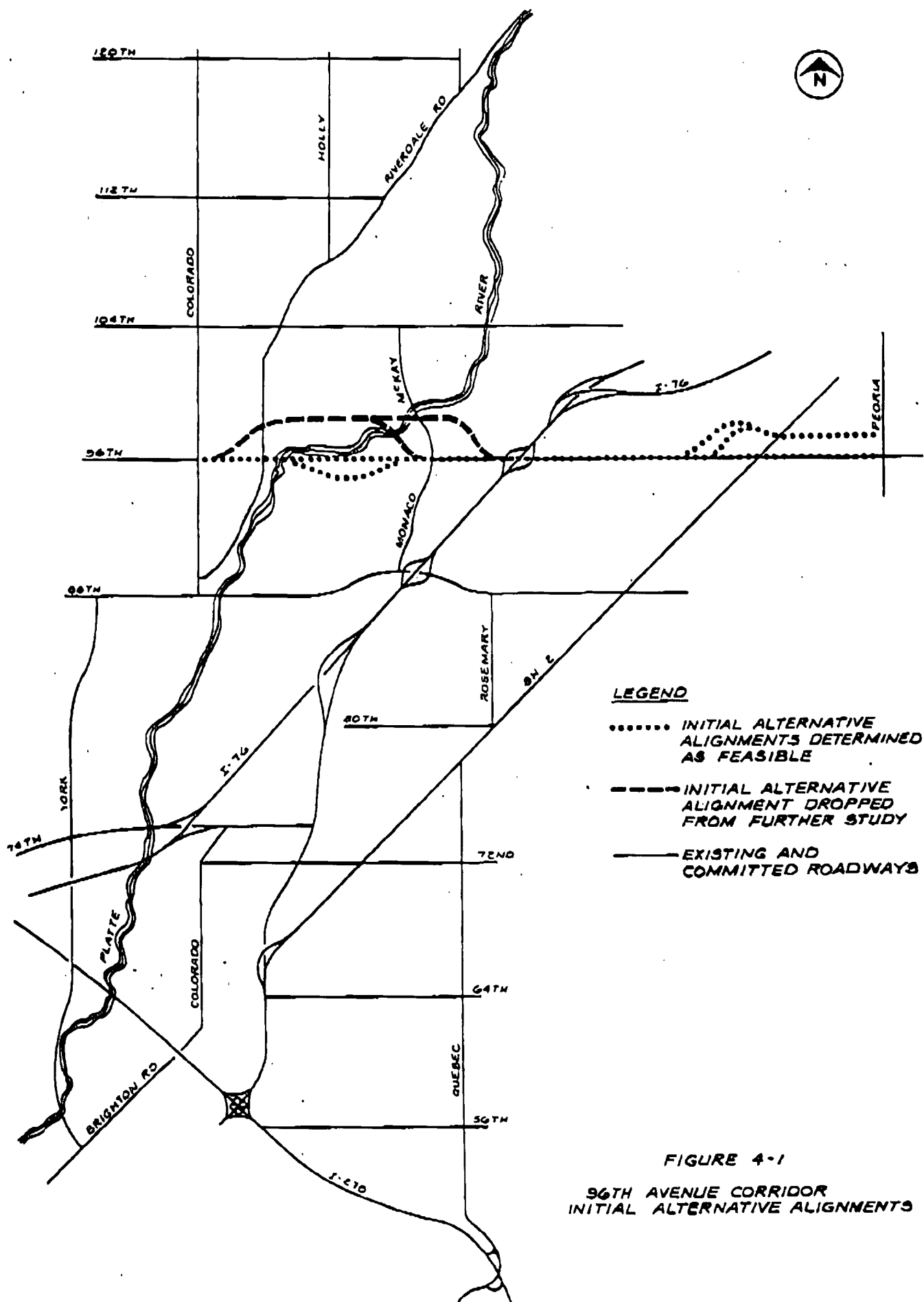
The east end of the 96th Avenue corridor is at Peoria Street. Review of property ownership and general conditions east of Peoria Street indicates that the alternative alignments west of Peoria Street are compatible with conditions east of Peoria Street.

Based on the initial screening, two feasible alternatives were refined and identified for 96th Avenue between Colorado Boulevard and I-76, and three feasible alternatives were identified between I-76 and Peoria Street. Figure 4-1 shows the initial alternative alignments that were screened in the 96th Avenue Corridor.

QUEBEC STREET/VASQUEZ BOULEVARD

The initial alternatives for the Quebec Street/Vasquez Boulevard corridor began at the intersection of Quebec Street and 120th Avenue on the north boundary of the study area, and ended at the interchange of I-76 and Vasquez Boulevard on the south.

Between 120th Avenue and 104th Avenue, three initial alternatives were identified. The first alternative was an extension of existing Quebec Street due south to 112th Avenue, which then curved west to intersect with 104th Avenue approximately 1,800 feet east of Riverdale Road. This alignment was constrained by the Lower Grange Hall Creek Drainage. The second alternative curved west after crossing Riverdale Road south of 120th Avenue and approximately

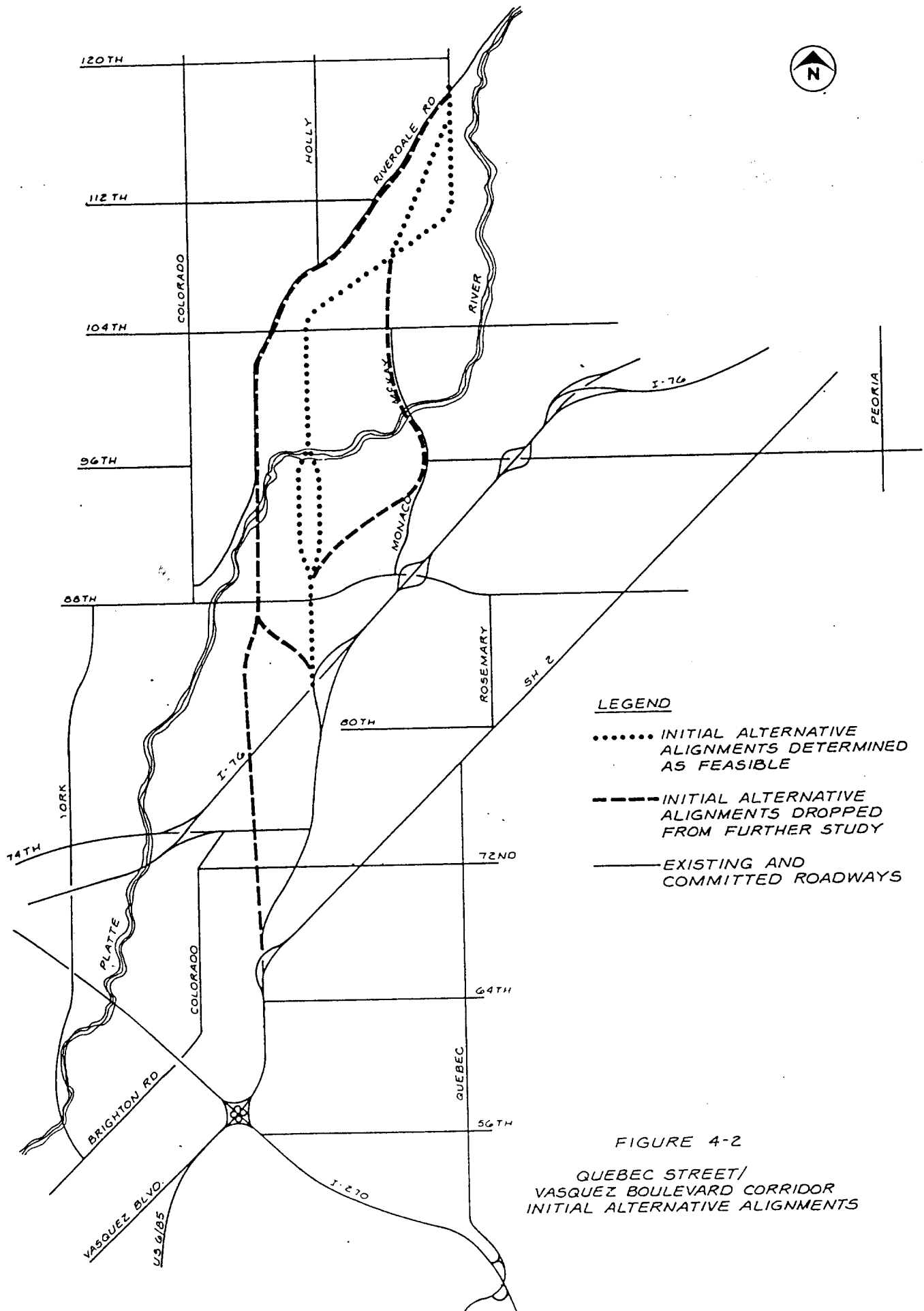


paralleled Riverdale Road. Just north of the Lower Grange Hall Creek Drainage, the second alternative coincided with the first alternative to 104th Avenue. The third alternative followed Riverdale Road south of 120th Avenue to 104th Avenue. This third alternative was dropped from further analysis because the roadway widening and modifications required to meet horizontal design criteria along existing Riverdale Road would have required relocation of several private residences. A modification of the first two alternatives was also identified that went due south after crossing the Lower Grange Hall Creek Drainage, and aligned with McKay Road/Monaco Street at 104th Avenue.

Three initial alignment alternatives were identified for the Quebec Street/Vasquez Boulevard corridor between 104th Avenue and 96th Avenue. The first followed the existing McKay Road/Monaco Street alignment. This alignment was eliminated because it bisected the South Adams County Wastewater Treatment Plant. It is not practical to widen the existing roadway to the required cross section width required for a regional facility in that area. This alternative also went through approved gravel mining operations on the Spratt-Platte Ranch and would have been located in the Platte River 100-year flood plain limits for approximately 3,100 feet more than the other alternatives, before it connected to Vasquez Boulevard at I-76. The second alternative between 104th Avenue and 96th Avenue was a direct north-south alignment on the east side of the North County Village subdivision, running approximately along a Holly Street alignment. This was the only alignment in the area that was not dropped from further study. The third alternative between 104th Avenue and 96th Avenue followed Riverdale Road. This alternative would have the same impacts on residential properties as the Riverdale Road alignment previously discussed between 120th Avenue and 104th Avenue. Therefore, it was eliminated from further consideration.

Five initial alternative alignments were identified for the Quebec Street/Vasquez Boulevard corridor between 96th Avenue and Vasquez Boulevard. The first alternative went due south from the east side of the North County Village subdivision and curved west to intersect 88th Avenue. It then went due south to form the north leg of the Vasquez Boulevard interchange with I-76. The second alternative curved west just south of 96th Avenue to follow Public Service Company's 230 kilovolt overhead (kVO) power lines for approximately 600 feet. It then curved due south to cross 88th Avenue, and continued south of 88th Avenue to connect to Vasquez Boulevard as the north leg of the Vasquez Boulevard interchange with I-76. The third alternative went south of 96th Avenue along McKay Road/Monaco Street; however, it was dropped from further consideration for reasons previously discussed. The fourth alternative was located south of 96th Avenue along the Riverdale Road alignment for 1,200 feet and then went due south until it crossed the Platte River and intersected 88th Avenue. South of 88th Avenue, it curved east to intersect the Vasquez Boulevard interchange with I-76. This alternative was eliminated from further consideration because of its required lake crossing between 96th Avenue and the Platte River. A fifth alternative was identified that followed the fourth alignment to 88th Avenue, curved west, then curved south to cross I-76 at the Dahlia Street overpass. This fifth alternative was eliminated from further consideration because there was no practical way to get the alignment back to Vasquez Boulevard south of I-76.

Figure 4-2 shows the initial alternative alignments that were screened in the Quebec Street/Vasquez Boulevard corridor.



LEGEND

- INITIAL ALTERNATIVE ALIGNMENTS DETERMINED AS FEASIBLE
- INITIAL ALTERNATIVE ALIGNMENTS DROPPED FROM FURTHER STUDY
- EXISTING AND COMMITTED ROADWAYS

FIGURE 4-2

QUEBEC STREET/
VASQUEZ BOULEVARD CORRIDOR
INITIAL ALTERNATIVE ALIGNMENTS

QUEBEC STREET/QUEBEC STREET

The Quebec Street to Quebec Street initial alignment alternatives were eliminated from the Quebec Street/Vasquez Boulevard corridor when it was determined that a connection to Quebec Street on the south would not function as well as a regional arterial connection to Vasquez Boulevard. However, the need for a Quebec Street to Quebec Street principal arterial connection was identified in addition to the Quebec Street to Vasquez Boulevard connection. A separate study corridor was identified in which alternatives were developed, screened, and evaluated for a Quebec Street to Quebec Street connection. The following paragraphs describe the initial alignments identified for the Quebec Street/Quebec Street corridor.

Four initial alignment alternatives were identified for Quebec Street to Quebec Street between 120th Avenue and I-76. The first alternative extended Quebec Street due south until it crossed the Platte River halfway between 112th Avenue and 104th Avenue. The alignment then went due south until it curved east to cross I-76 north of the 96th Avenue interchange. The second alternative went due south from Quebec Street, curved slightly to the west between 112th Avenue and 104th Avenue, crossed the Platte River approximately 1,000 feet east of McKay Road, and curved east south of 96th Avenue to cross I-76 just south of the 96th Avenue interchange. The third alternative connected Quebec Street to the 104th Avenue intersection with McKay Road in a direct line, followed McKay Road south of the Platte River, and curved east to cross I-76 just south of the 96th Avenue interchange, at the same location as the second alternative. The final alternative between Quebec Street and I-76 followed the Riverdale Road alignment from 120th Avenue to just south of 96th Avenue and curved east to

connect with 88th Avenue just west of the 88th Avenue interchange with I-76. This alternative was eliminated from further analysis because of high residential impacts associated with improving and widening Riverdale Road, and because it would require realigning the 88th Avenue interchange to a north-south direction from its existing east-west direction.

Three primary alignments were initially identified for the Quebec Street/Quebec Street corridor between I-76 and 88th Avenue. The first alignment crossed I-76 north of the 96th Avenue interchange, curved due south, and intersected 88th Avenue approximately 1,000 feet east of Rosemary Street. The second alignment, a variation of the first, curved back to the west just south of the Union Pacific Railroad tracks and ran parallel to the tracks until it curved back to the south to become the north leg of the 88th Avenue intersection with Rosemary Street. The third alignment curved southeast and intersected 88th Avenue approximately 1,000 feet east of Rosemary Street. The second and third alternatives between I-76 and 88th Avenue crossed I-76 just south of the 96th Avenue interchange. The three initial alternative alignments were determined to be feasible in this section of the Quebec Street/Quebec Street corridor even though the second and third alignments crossed the South Adams County Alluvial Recharge Facility.

Only two alternatives were identified for the Quebec Street/Quebec Street corridor between 88th Avenue and 56th Avenue. The first followed the existing Rosemary Street alignment south of 88th Avenue to SH 2. It then curved east to provide a perpendicular intersection with SH 2, curved west on the south side of SH 2 to the existing Quebec Street alignment, and followed existing Quebec Street to the 56th Avenue intersection. The second alternative ran parallel to Rosemary Street and approximately 1,000 feet to the east to

SH 2, curved east to provide a perpendicular intersection with the highway, and curved west just south of SH 2 to a point approximately 600 feet east of existing Quebec Street. It then paralleled Quebec Street until it curved west north of 56th Avenue to align with existing Quebec Street.

Figure 4-3 shows the initial alternative alignments that were screened in the Quebec Street/Quebec Street corridor.

COLORADO BOULEVARD/YORK STREET

This is the shortest of the four corridor study areas; however, it has the greatest number of constraints from the standpoint of physical conditions and existing development.

The initial alternatives in this corridor began at the intersection of Colorado Boulevard and 88th Avenue, and ended at the intersection of York Street and 74th Avenue. It was assumed at the onset of the study that York Street would be widened in its present alignment between 74th Avenue and I-270. The following is a brief description of the initial alternatives developed for the Colorado Boulevard/York Street corridor, and a discussion of why some of the alternatives were eliminated from further analysis.

Three initial alternative alignments were identified in this corridor. South of 88th Avenue, the first alternative followed the designated right-of-way for a southern extension of Colorado Boulevard located just east of the Thornton City Shops complex. The alternative then curved west across the Riverdale Farms Mobile Home Subdivision, crossed Steele Street approximately 1,800 feet south of 84th Avenue, followed the north side of the KLZ radio towers, curved south onto existing York Street approximately 1,000 feet north of 80th Avenue, and followed existing York Street south to 74th Avenue. The section of this alternative west of

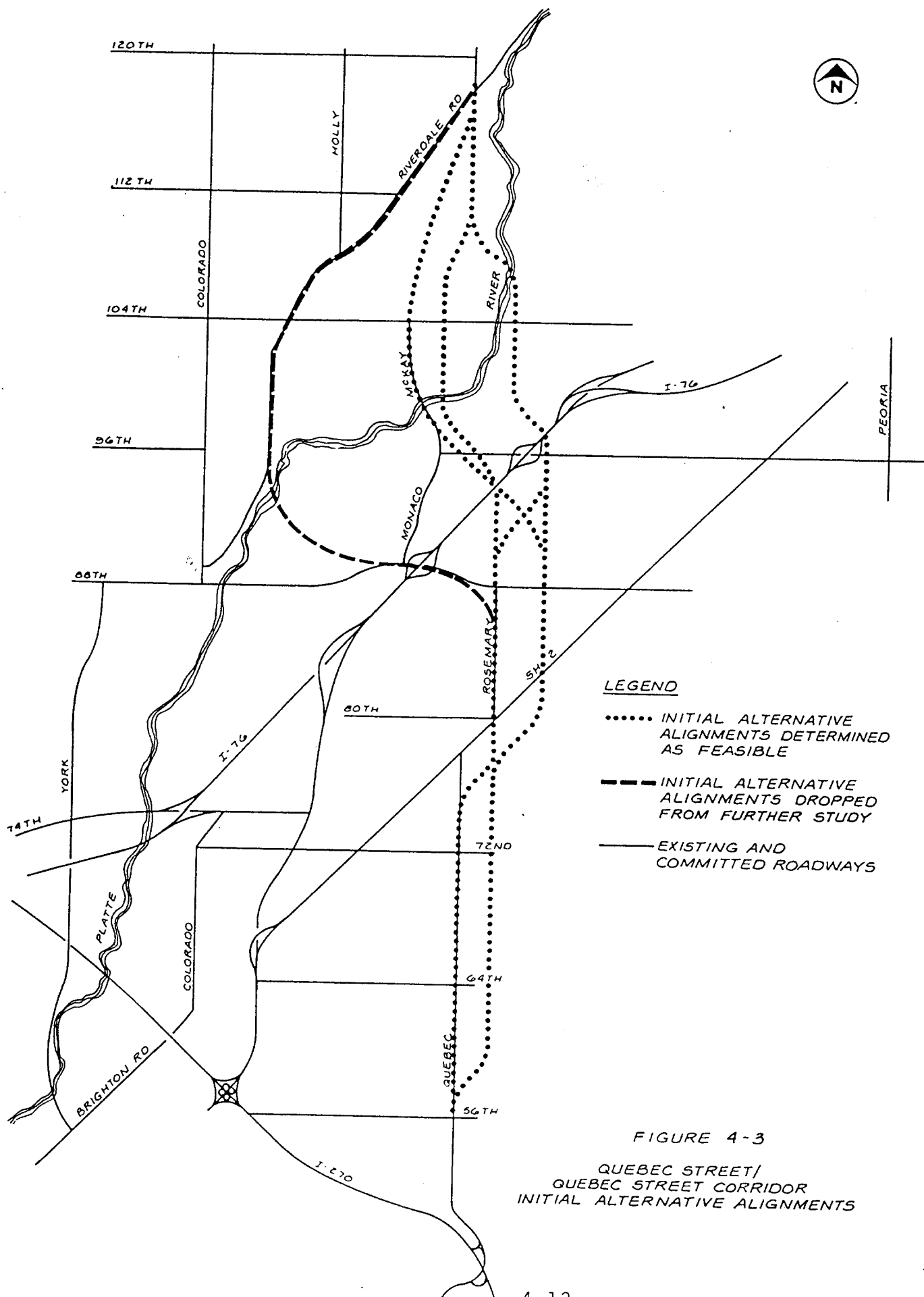


FIGURE 4-3
 QUEBEC STREET/
 QUEBEC STREET CORRIDOR
 INITIAL ALTERNATIVE ALIGNMENTS

Steele Street was dropped from further analysis because of the major residential impacts that would occur along existing York Street. The second alternative curved west across the Riverdale Farms Mobile Home Subdivision south of the Thornton City Shops complex, curved south to follow the west side of the reclaimed gravel mining lagoon, then curved west, crossed the Union Pacific Railroad tracks, followed the south side of Niver Creek to York Street, and followed existing York Street from approximately 80th Avenue to 74th Avenue. The southern half of this alternative was dropped from further consideration because of the difficult canal crossing and the residential impacts along York Street. The third alternative curved west across the Riverdale Farms Mobile Home Subdivision, intersected Steele Street south of 84th Avenue, followed Steele Street, curved west and crossed the Union Pacific Railroad approximately 200 feet north of the existing crossing, curved south and intersected York Street just north of the U-Haul lot, and followed York Street south to 74th Avenue. A fourth alternative was identified between Niver Creek and 74th Avenue to minimize residential impacts on York Street. This alignment curved south after crossing Niver Creek, paralleled York Street approximately 1,200 feet to the east, and then curved west to intersect York Street just north of 74th Avenue.

Figure 4-4 shows the initial alternative alignments that were screened in the Colorado Boulevard/York Street corridor.

FEASIBLE ALTERNATIVE ALIGNMENTS

As a result of the screening process described above, a number of feasible alignment alternatives were identified

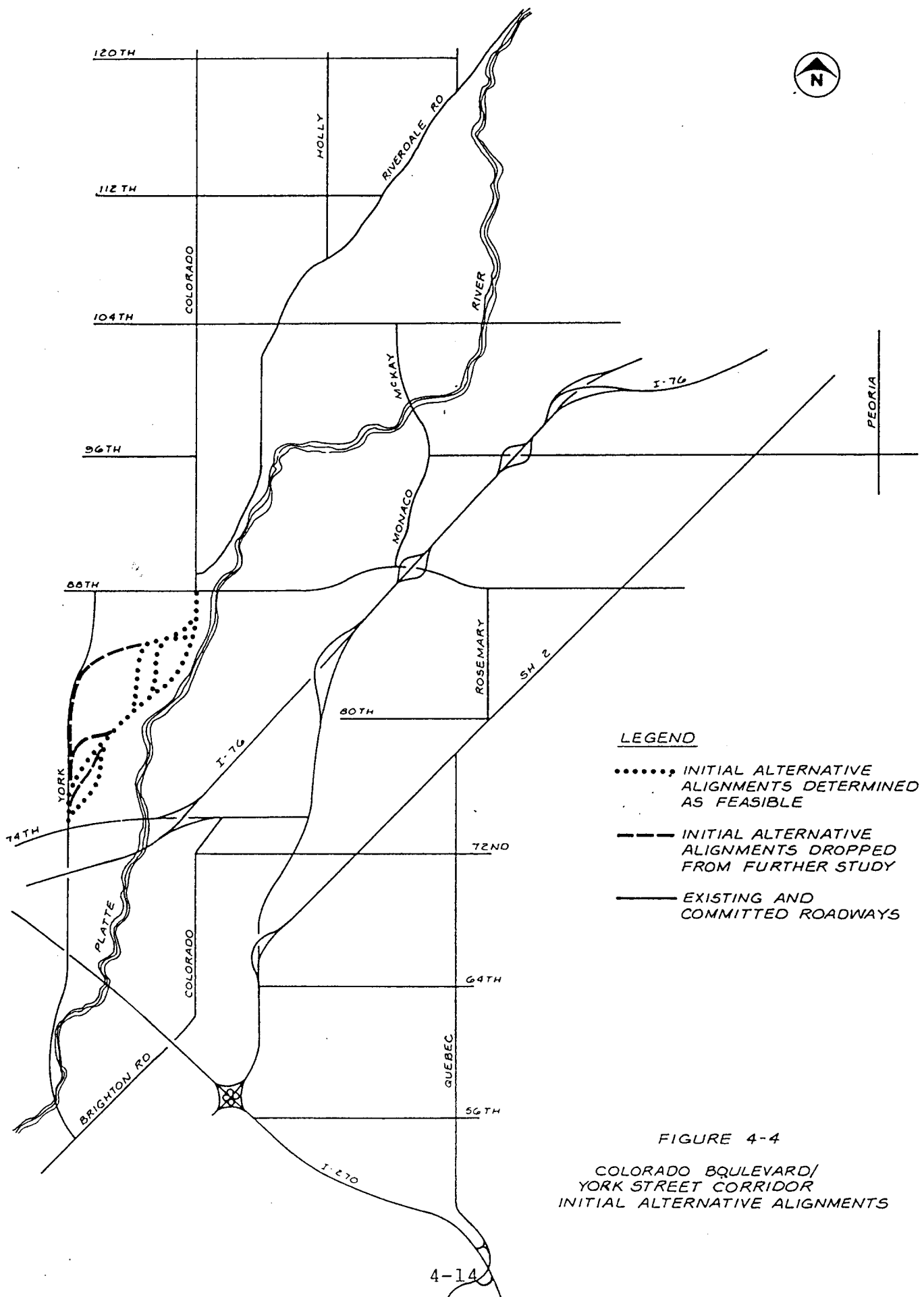


FIGURE 4-4
COLORADO BOULEVARD/
YORK STREET CORRIDOR
INITIAL ALTERNATIVE ALIGNMENTS

for each corridor. After the screening process, these feasible alternatives were drawn at a scale of 1"=400' and modified slightly to better fit local conditions.

For purposes of comparing the alternatives, the corridors were divided into segments in which one or more alignments were identified. The overall alignment alternatives for each corridor consist of the various combinations of alignments by corridor segments. The following discussion describes the corridor segments, and the alternative alignments in each segment of the corridors.

96TH AVENUE CORRIDOR

Segment 1

This segment extends between Colorado Boulevard and a point just west of the Burlington Ditch (approximately 0.6 mile west of SH 2).

Alignment A. This alignment follows the existing 96th Avenue alignment for its entire length. It begins on the west at Colorado Boulevard and crosses the Colorado Agricultural Canal, the Lower Clear Creek Canal, and Riverdale Road. It crosses the South Platte River and adjacent lake that is part of the Cooley Gravel Company mining operations. Proceeding east, the alignment intersects McKay Road, passes under I-76 via the existing underpass, and crosses the Union Pacific Railroad. This alignment then continues due east to the end of Segment 1, which is west of the Burlington Ditch.

Alignment B. This alignment is the same as Alignment A except that it angles to the southeast just east of Riverdale Road. It passes to the north of the Cooley Gravel Company plant site, crosses a future lake, parallels the future Cooley gravel conveyor, and then crosses a future

mining operations area as it swings back to the north to meet the straight 96th Avenue alignment, which is just west of McKay Road.

Segment 2

This segment extends between the Burlington Ditch and Peoria Street.

Alignment A. This alignment again runs due east coinciding with existing 96th Avenue. It crosses the Burlington Ditch, O'Brian Canal, Burlington Northern Railroad, SH 2, and runs along the northern boundary of the Rocky Mountain Arsenal to Peoria Street.

Alignment B. This alignment coincides with Alignment A for approximately 2,400 feet before it curves to the northeast just west of the Burlington Northern Railroad. It then curves back to the east, crosses the Burlington Northern Railroad tracks and SH 2, and then runs parallel approximately 1,200 feet north of Alignment A to Peoria Street.

Alignment C. This alignment curves to the northeast at the beginning of Segment 2. It curves back to the east just west of the Burlington Ditch, crosses the ditch and the O'Brian Canal, and meets Alignment B just west of the Burlington Northern Railroad tracks. It then coincides with Alignment B to Peoria Street.

The following overall alignment alternatives for 96th Avenue consist of the various combinations of alignments in Segments 1 and 2 (indicated by their segment number and alternative letter designations):

- o Alternative 1A-2A
- o Alternative 1A-2B

- o Alternative 1A-2C
- o Alternative 1B-2A
- o Alternative 1B-2B
- o Alternative 1B-2C

The alternative alignments for 96th Avenue are shown in Figures 4-5 through 4-7.

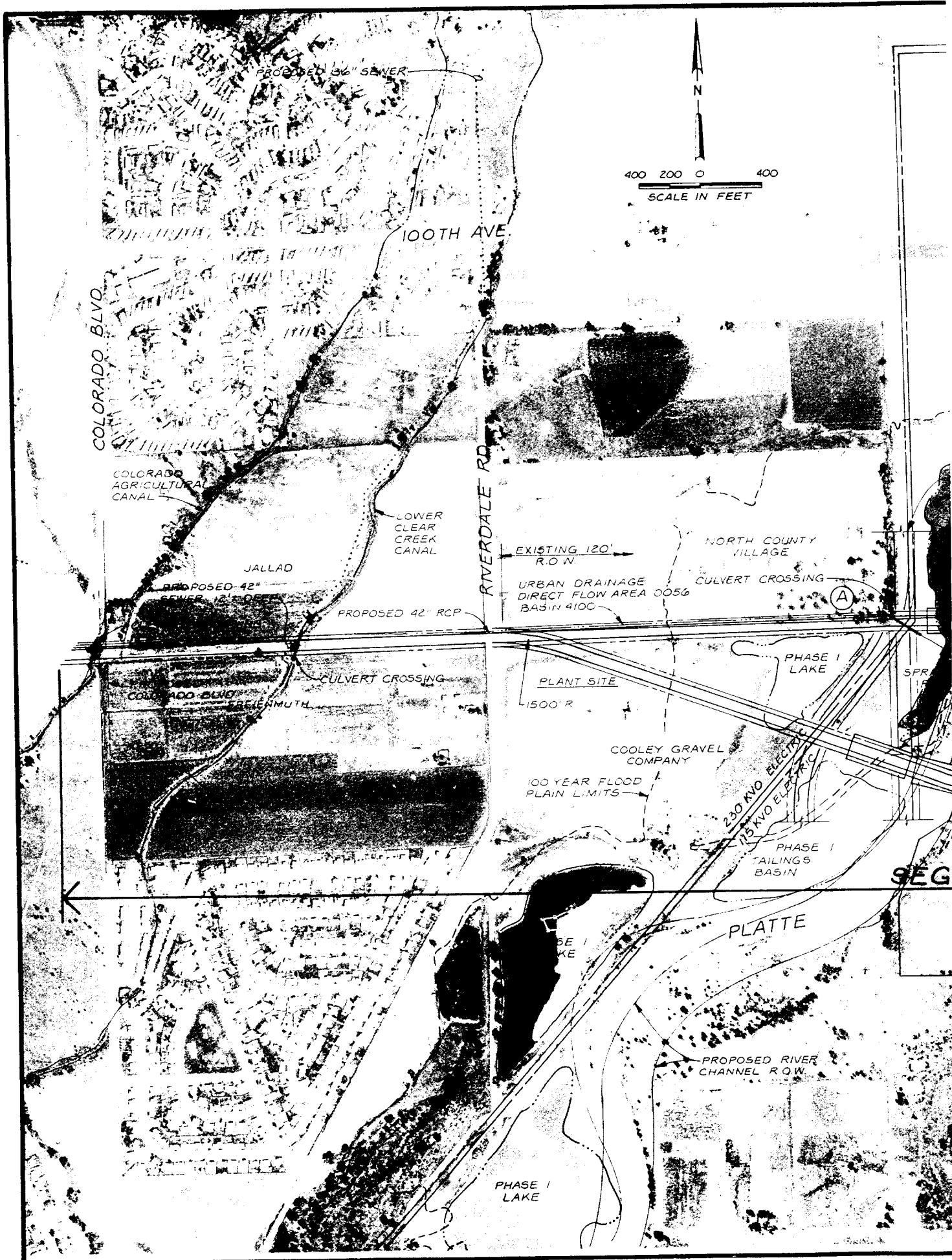
QUEBEC STREET/VASQUEZ BOULEVARD CORRIDOR

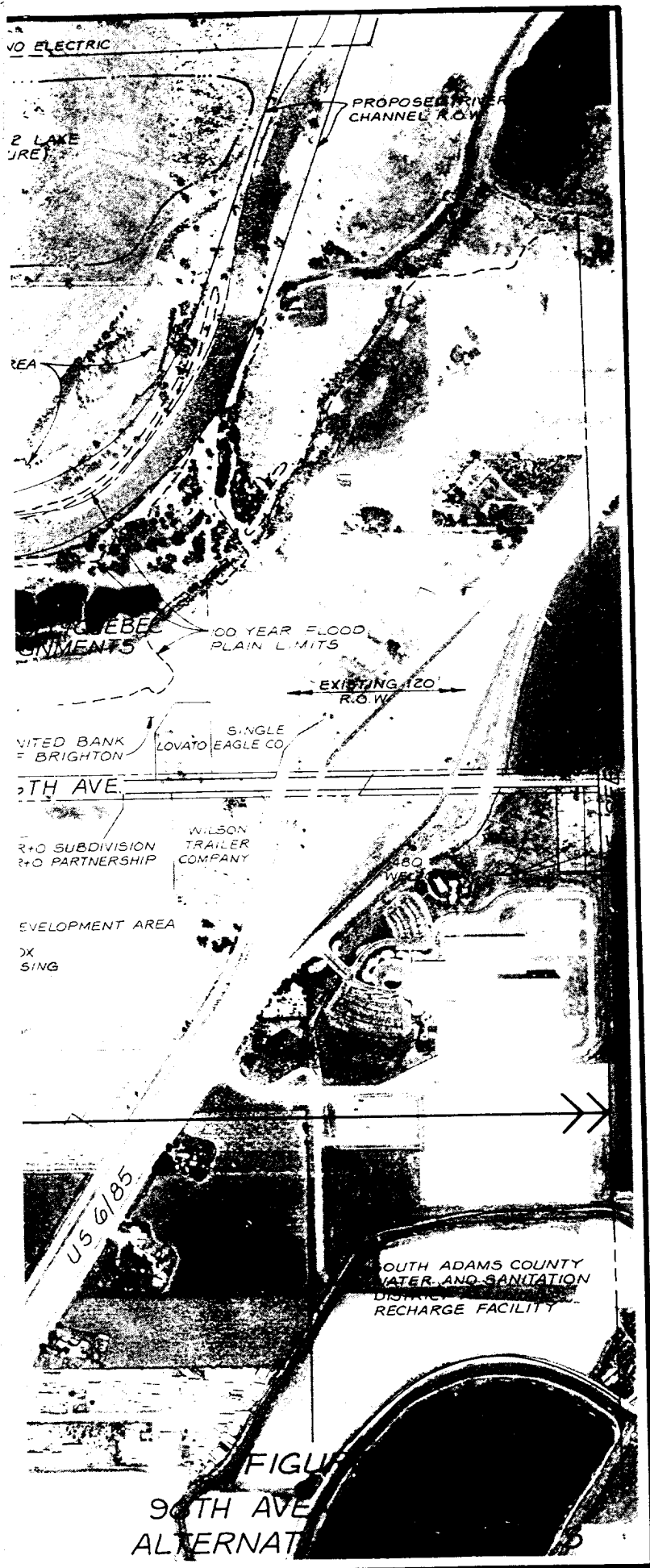
Segment 1

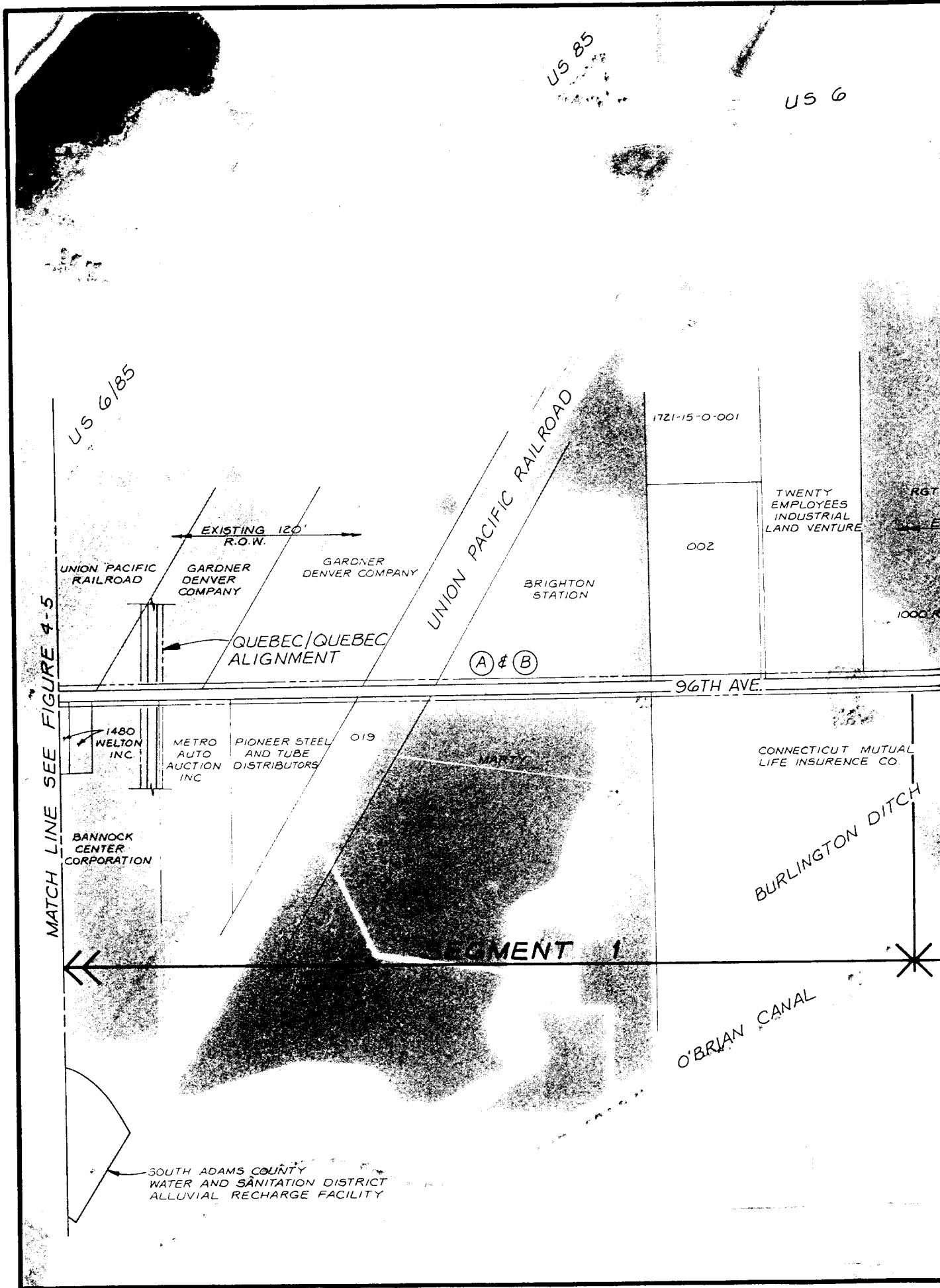
This segment extends from existing Quebec Street at 120th Avenue on the north diagonally to the southwest to approximately 100th Avenue and Holly Street.

Alignment A. This alignment breaks new ground south of 120th Avenue along Quebec Street. It intersects Riverdale Road and 112th Avenue. South of 112th Avenue, it runs diagonally to the southwest and crosses lower Grange Hall Creek. North of 104th Avenue, it again turns to the south and runs due south to 100th Avenue.

Alignment B. This alignment coincides with Alignment A for approximately 1,600 feet south of 120th Avenue. It then angles to the southwest running approximately parallel and within 200 feet of Riverdale Road. As it continues southwest, its separation from Riverdale Road increases to approximately 2,000 feet where it intersects Alignment A. This alignment then coincides with Alignment A for the remainder of Segment 1.







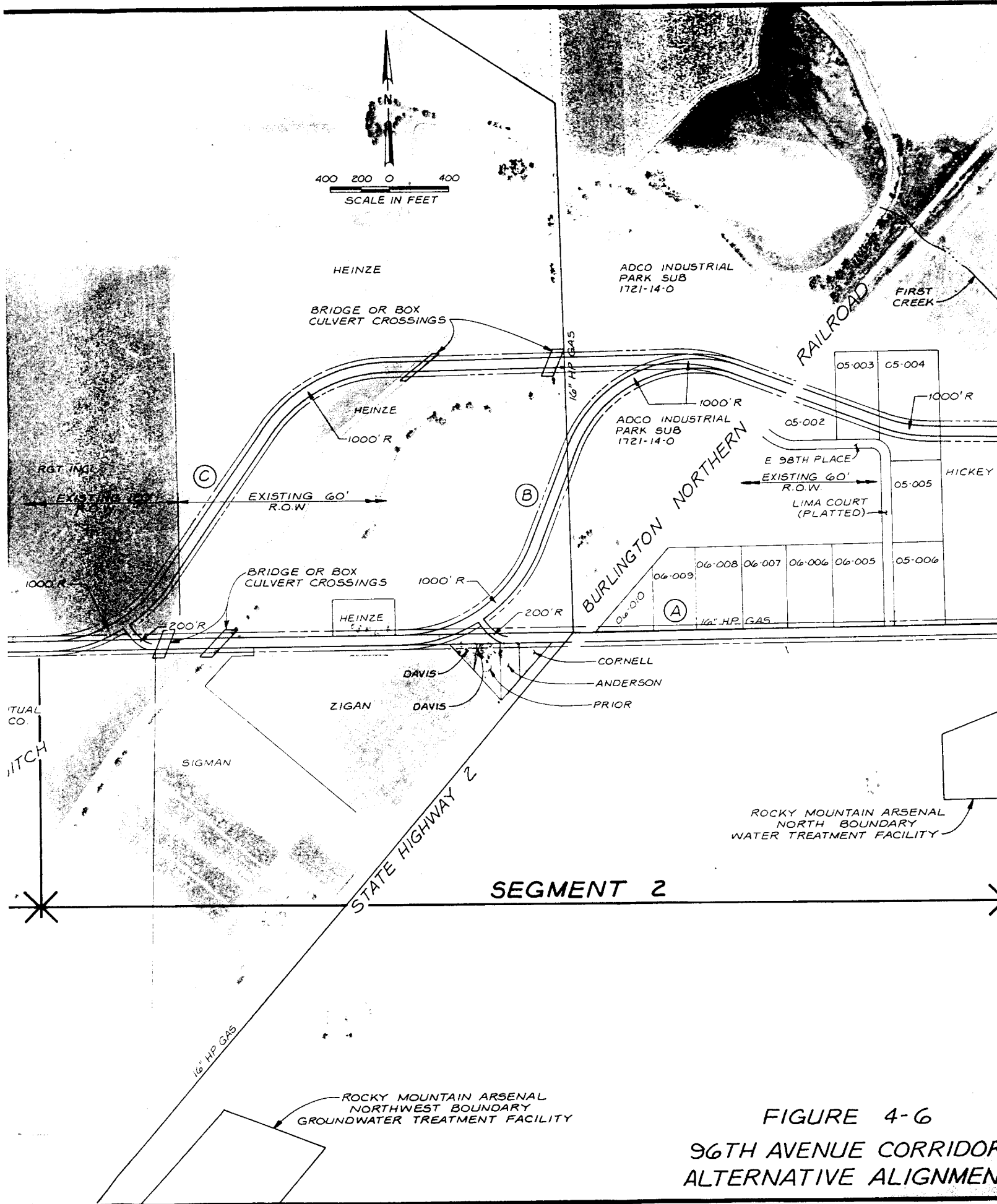


FIGURE 4-6
96TH AVENUE CORRIDOR
ALTERNATIVE ALIGNMENT

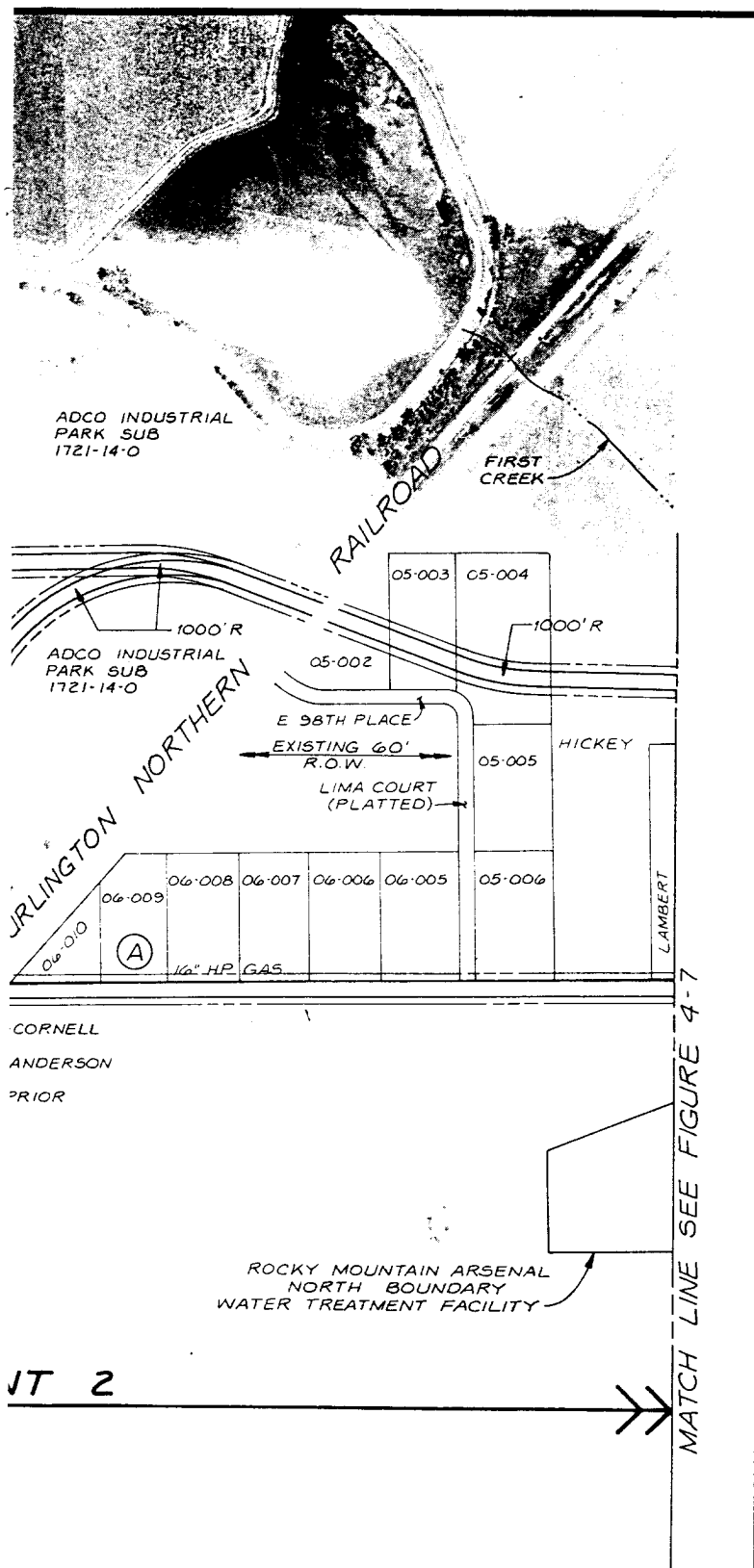


FIGURE 4-6
96TH AVENUE CORRIDOR
ALTERNATIVE ALIGNMENTS

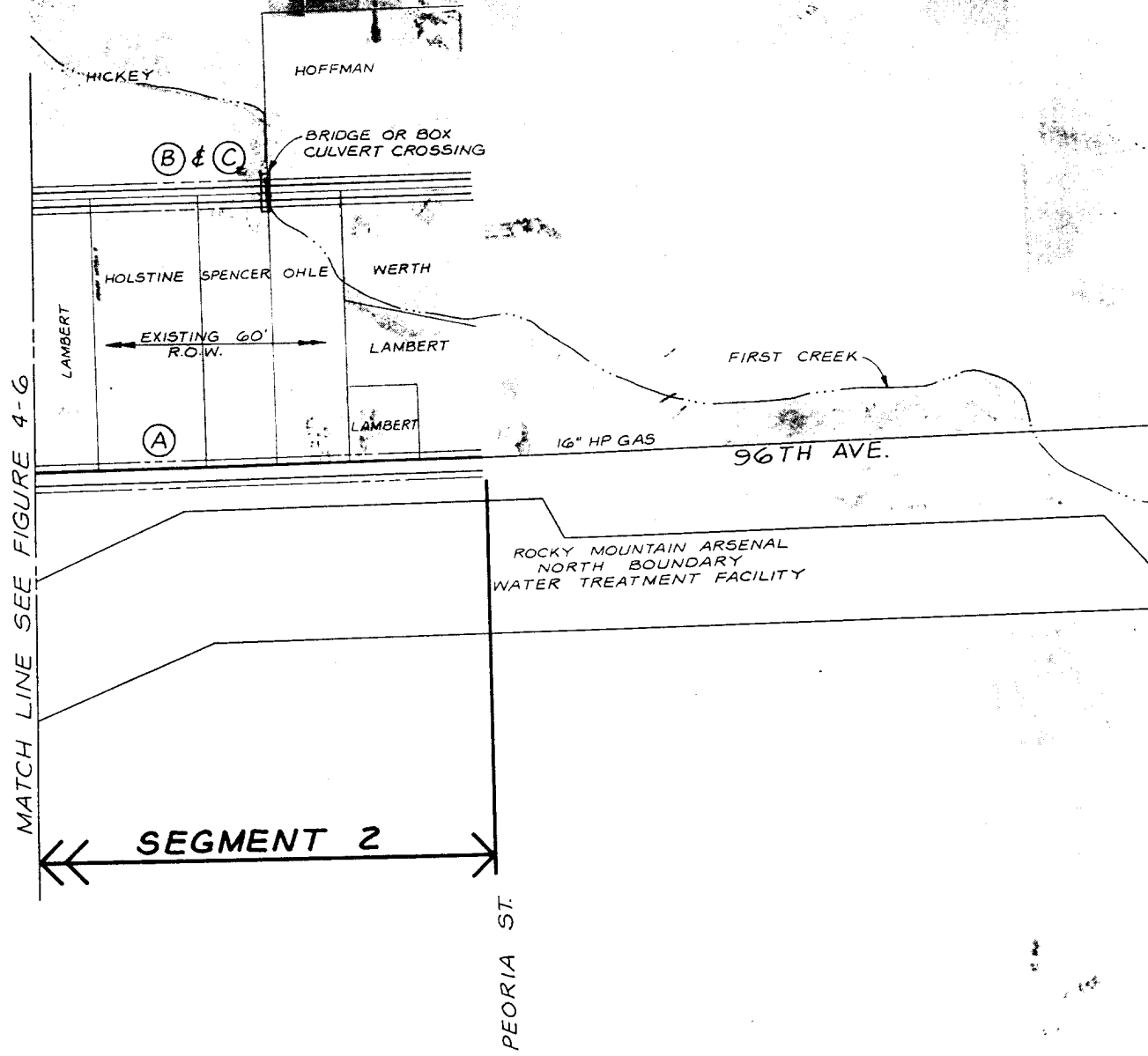
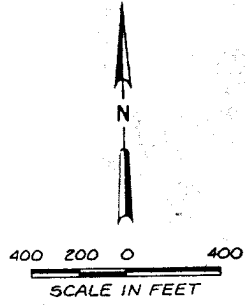


FIGURE 4-7
96TH AVENUE CORRIDOR
ALTERNATIVE ALIGNMENTS

Segment 2

This segment extends from 100th Avenue at Holly Street to US 6/85 approximately 800 feet south of I-76.

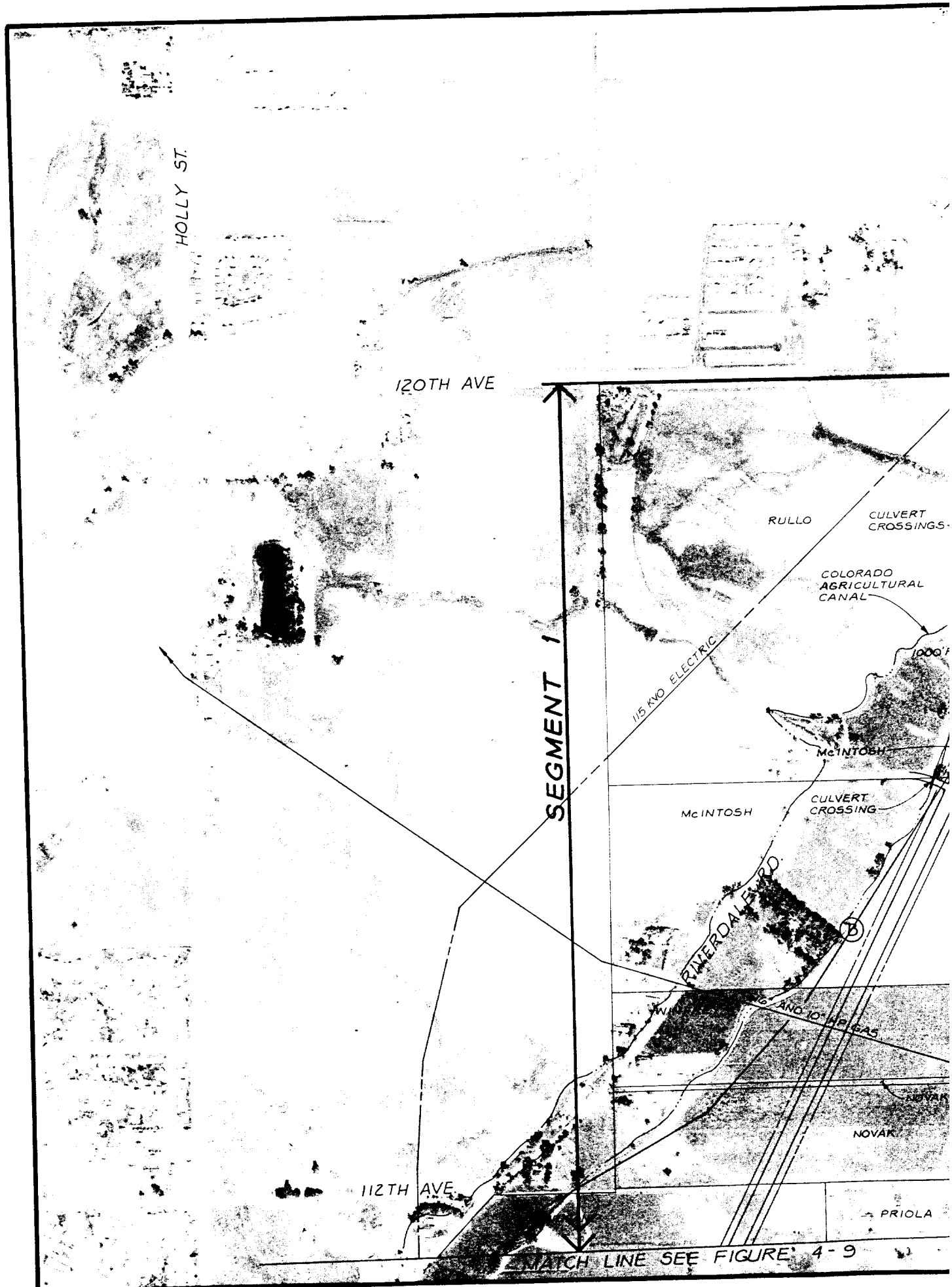
Alignment A. This alignment begins at 100th Avenue and a projection of Holly Street. It runs southward to intersect 96th Avenue, and then crosses a lake formed by mining operations of the Cooley Gravel Company, a small portion of the mining tailings basin, and the South Platte River. Approximately 1,500 feet south of the river, it angles southwest before heading due south to intersect 88th Avenue and form the north leg of the Vasquez Boulevard interchange with I-76.

Alignment B. This alignment coincides with Alignment A south to 96th Avenue where it angles southwest for approximately 1,100 feet. The alignment turns south again crossing through the middle of the Cooley Gravel Company tailings basin and the South Platte River. It continues south until it coincides with Alignment A approximately 800 feet north of 88th Avenue.

The overall alignment alternatives for the Quebec Street/Vasquez Boulevard corridor indicated by the segment number and alignment letter designation are the following:

- o Alternative 1A-2A
- o Alternative 1A-2B
- o Alternative 1B-2A
- o Alternative 1B-2B

Figures 4-8 through 4-11 show the alternative alignments.



HOLLY ST.

120TH AVE

SEGMENT 1

RULLO

CULVERT CROSSINGS

COLORADO AGRICULTURAL CANAL

115 KVO ELECTRIC

McINTOSH

McINTOSH

CULVERT CROSSING

RIVERDALE RD.

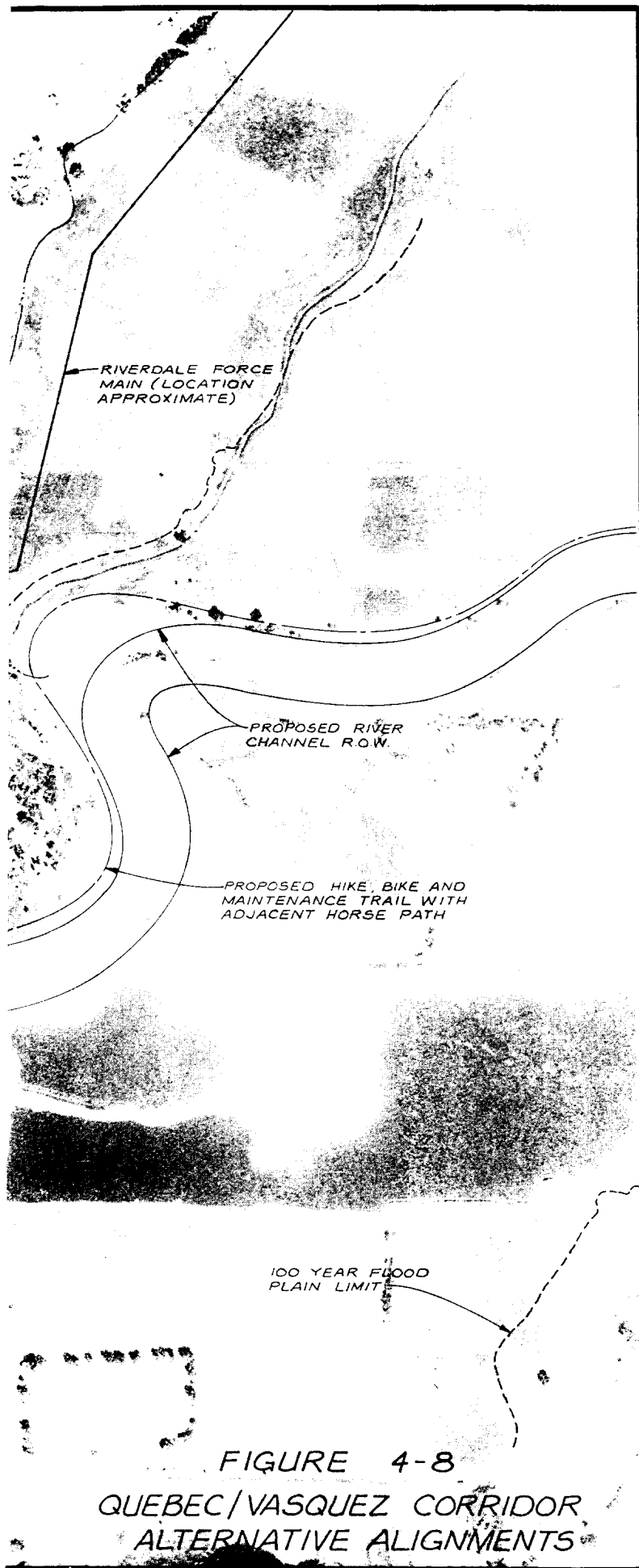
B

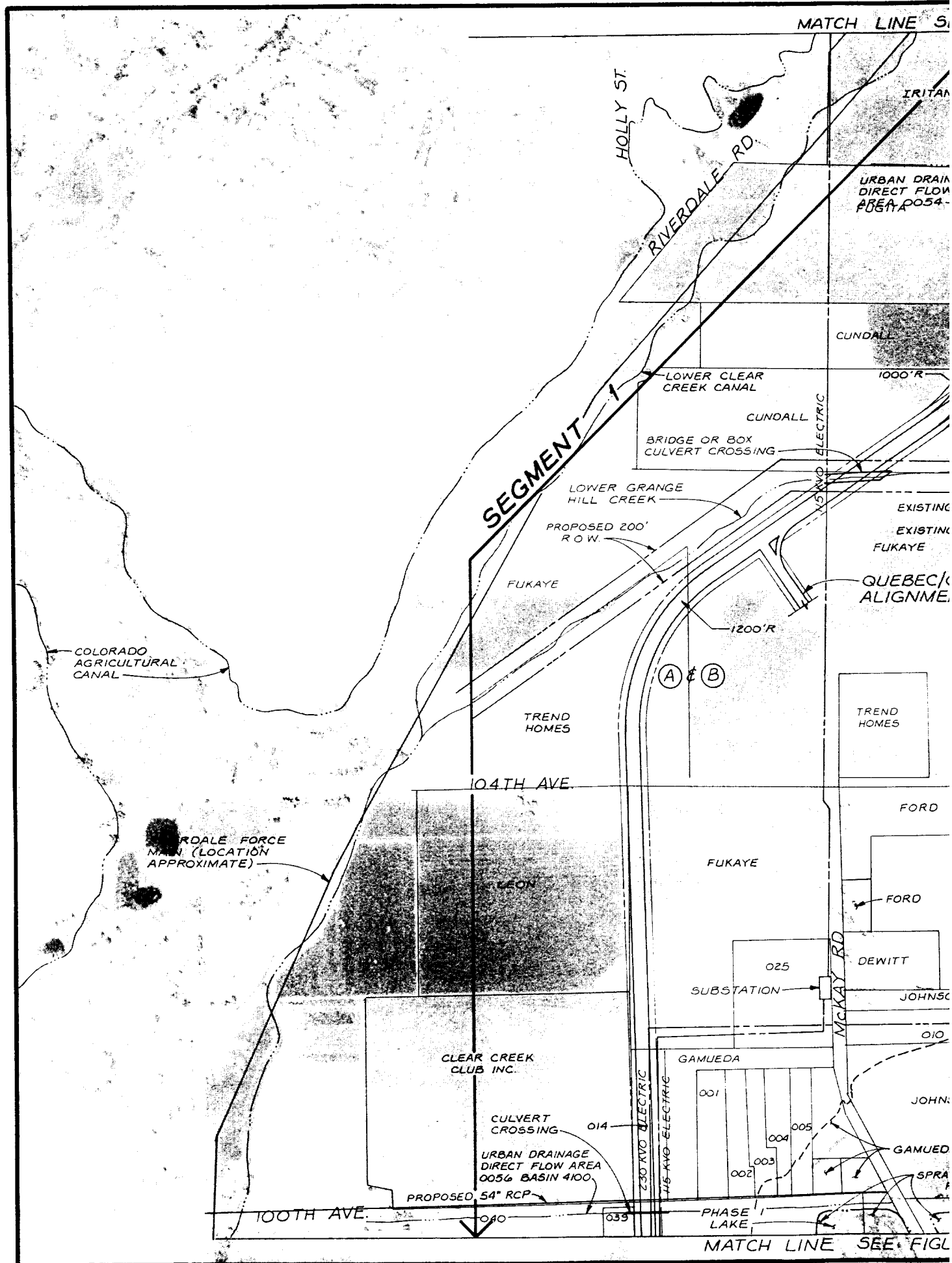
112TH AVE

NOVAR

PRIOLA

MATCH LINE SEE FIGURE 4-9





LINE SEE FIGURE 4-8

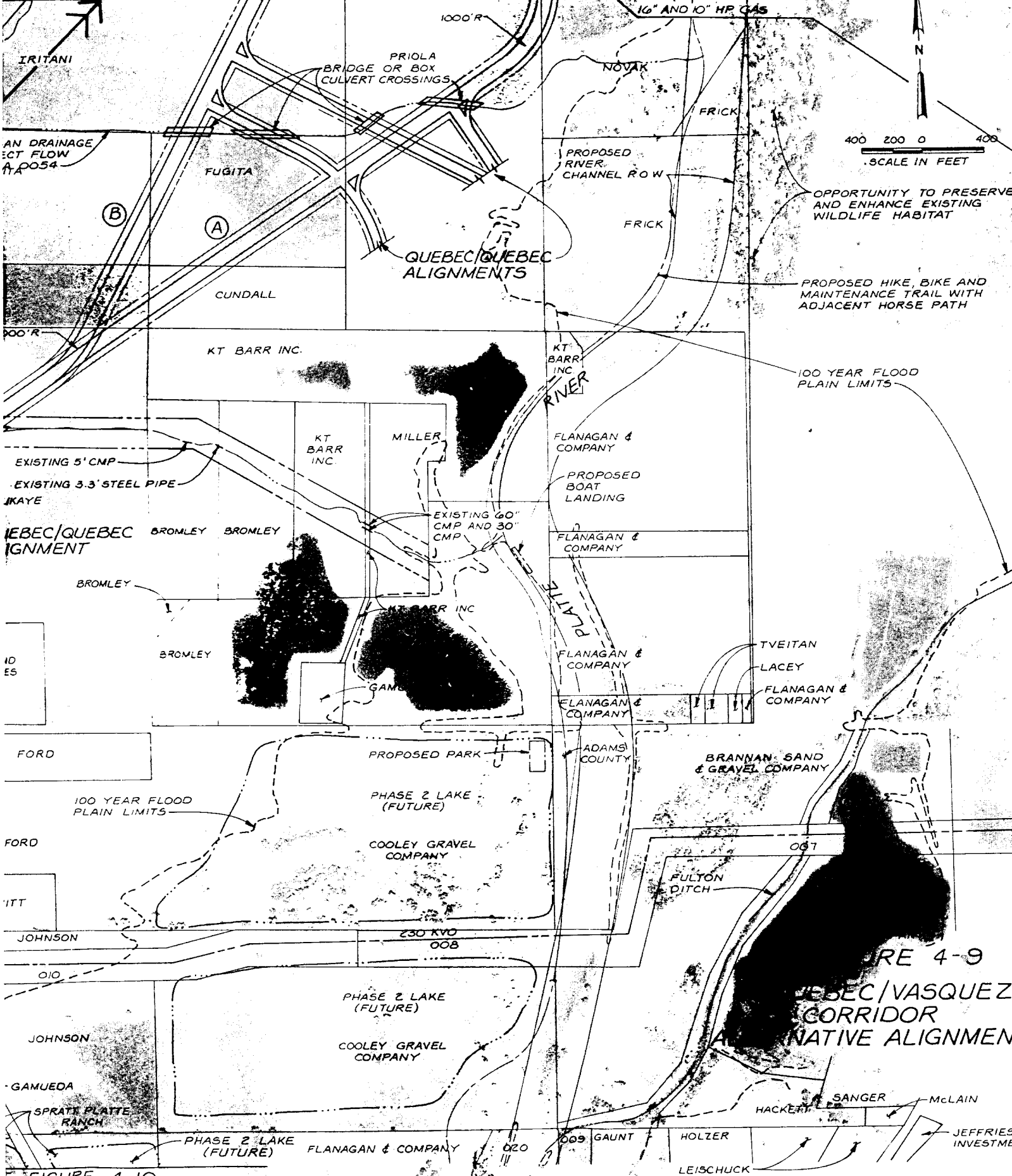
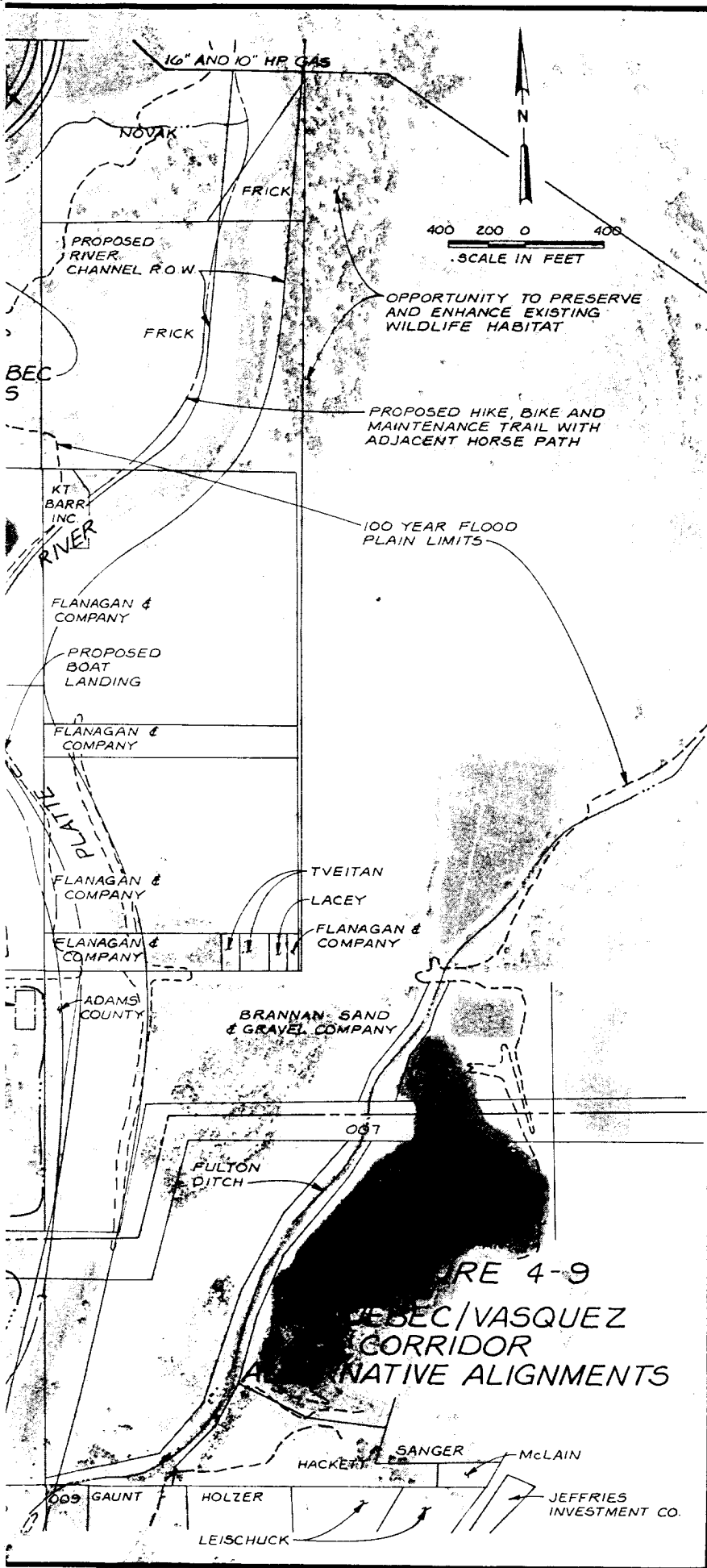
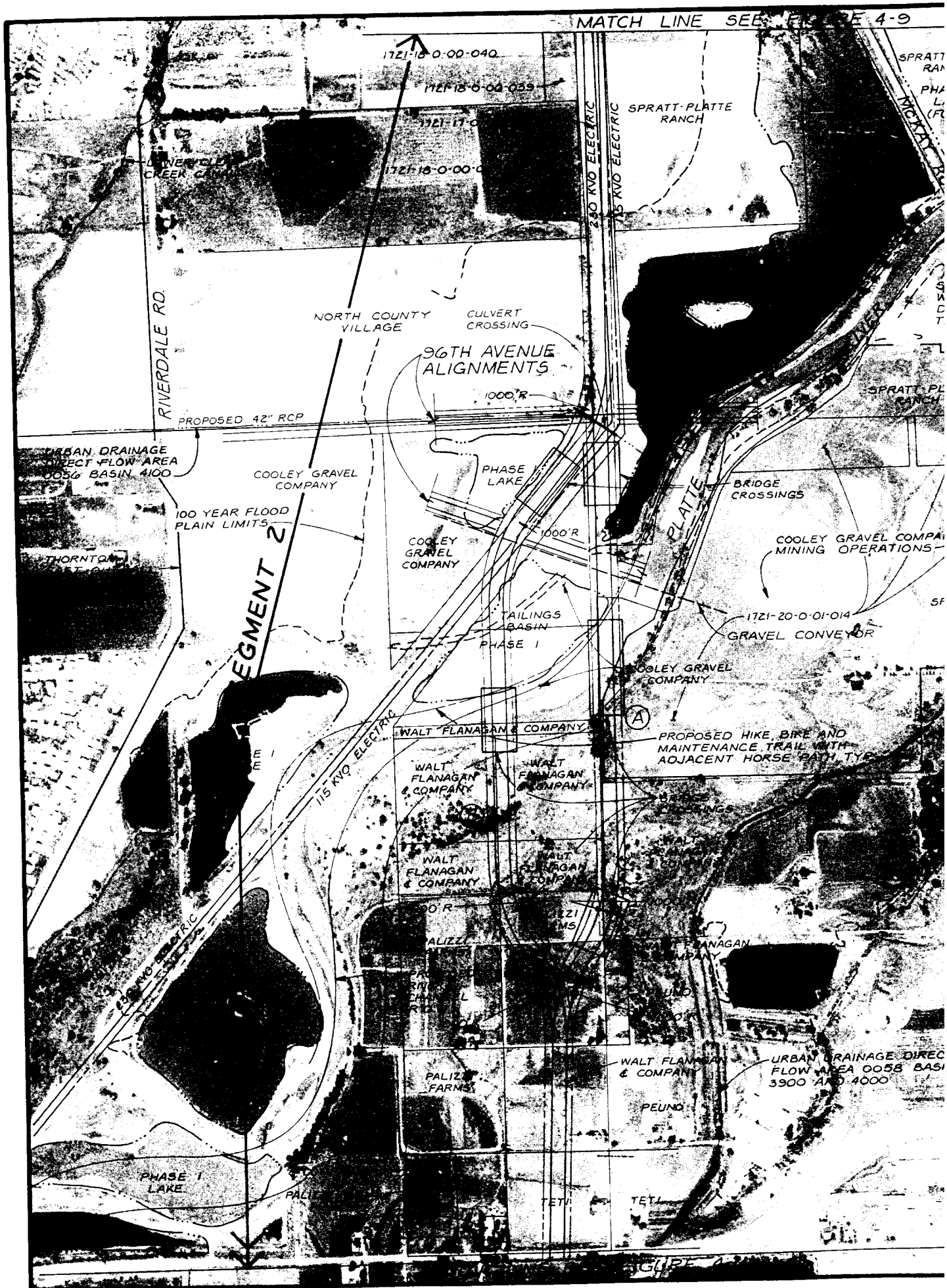


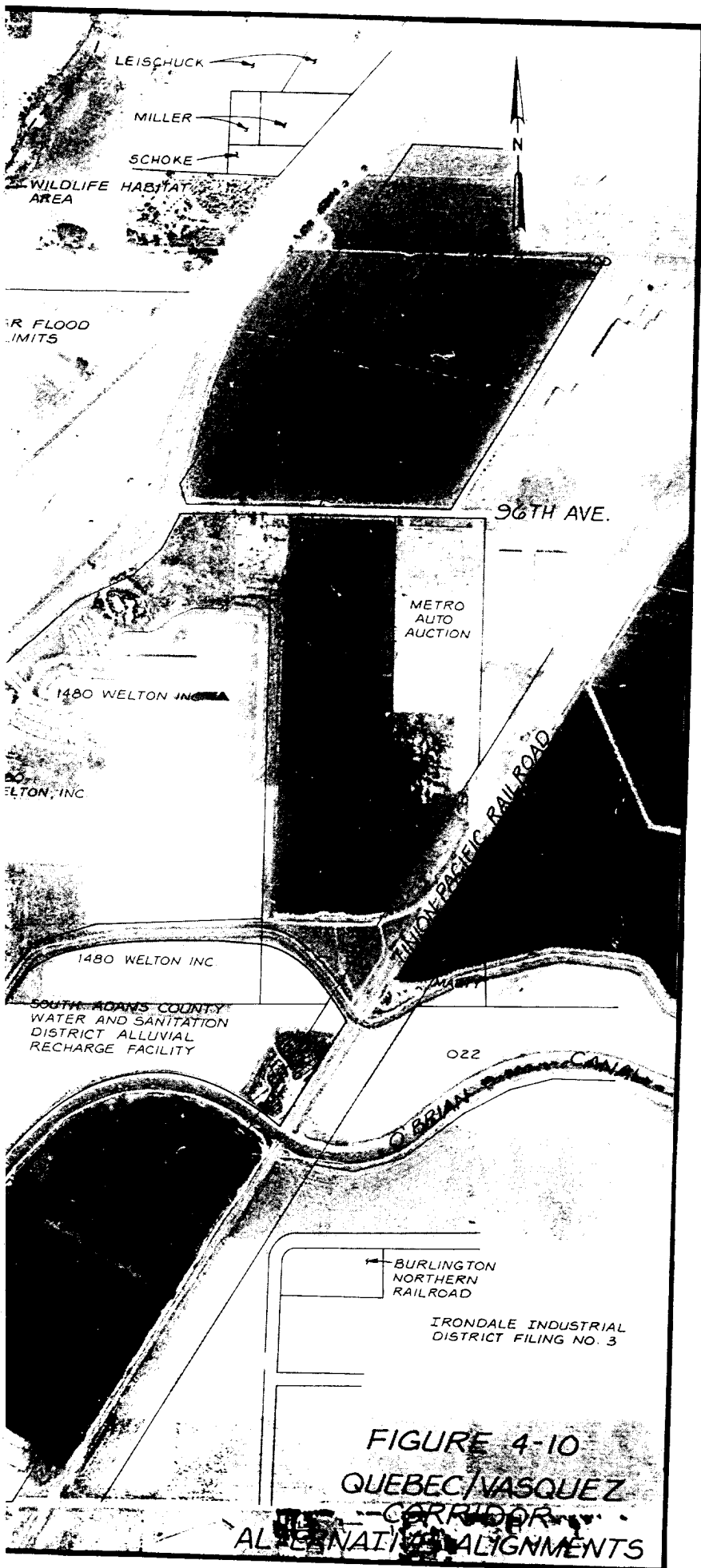
FIGURE 4-9
QUEBEC/VASQUEZ
CORRIDOR
ALTERNATIVE ALIGNMENT

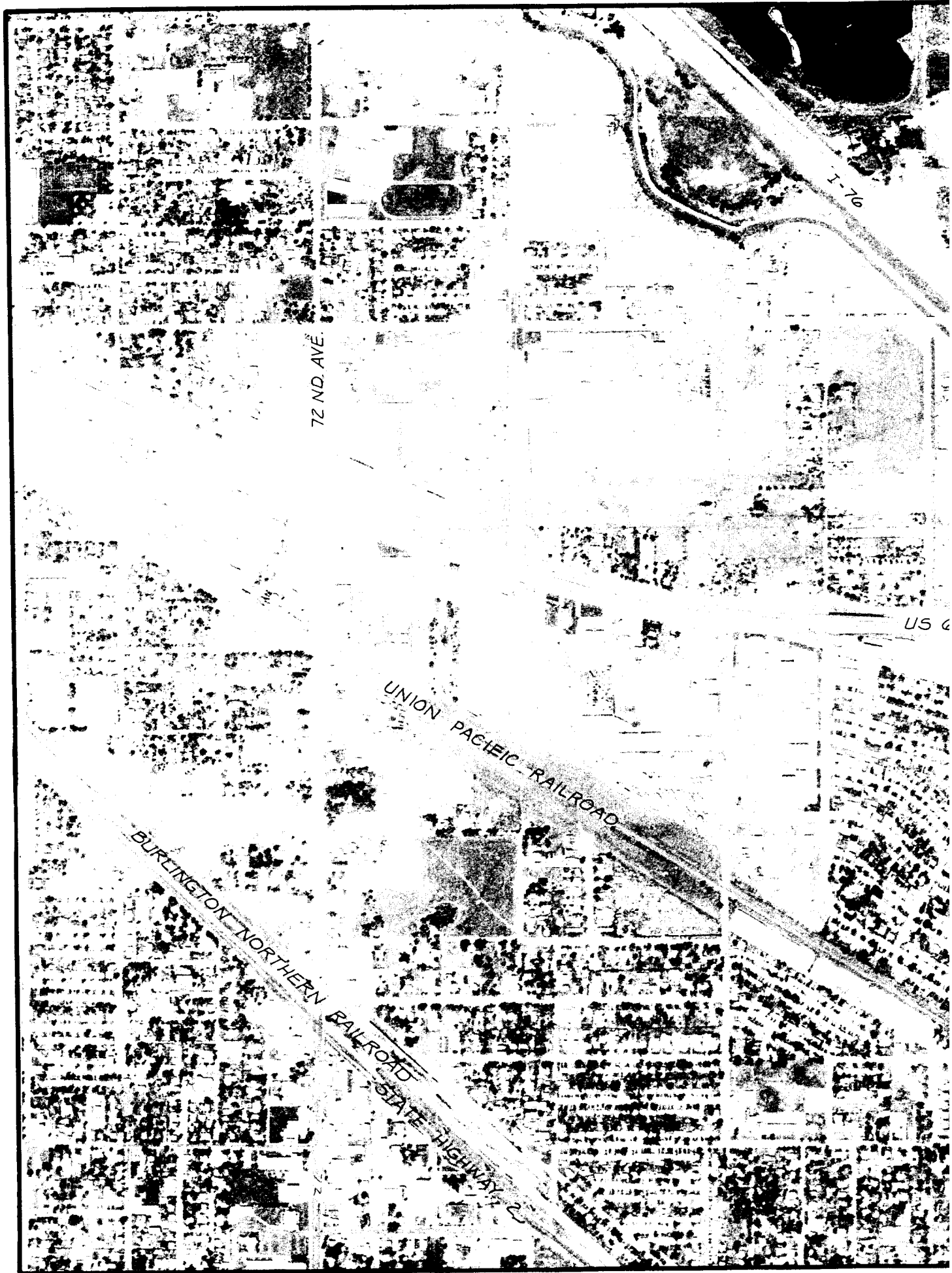
FIGURE 4-10



MATCH LINE SEE FIGURE 4-9







72 ND. AVE.

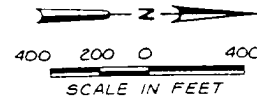
UNION PACIFIC RAILROAD

BURLINGTON NORTHERN RAILROAD

STATE HIGHWAY 2

I-76

US 6



DAHLIA STREET

ENT 2

US 6/85

BRIDGE
STRUCTURES

BRODA

BLOOD

BRODA

KINNEY

FLANAGAN

FLANAGAN

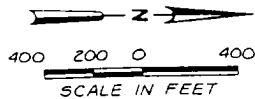
BRIDGE OR BOX
CULVERT
CROSSING

FRET

(A)

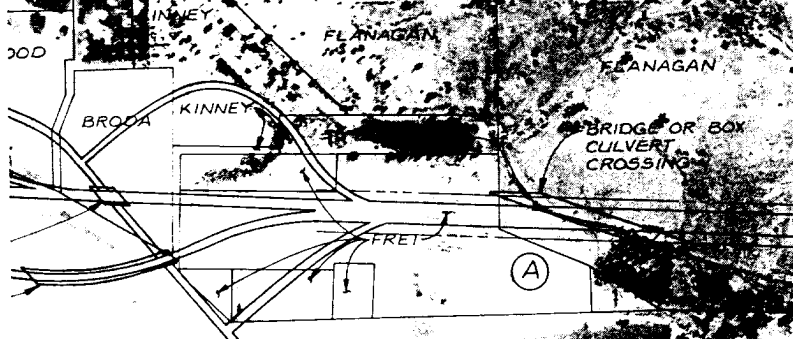
URBAN DRAIN
DIRECT FLOW
0068 DRAIN

FIGURE 4-1
QUEBEC-VAGUEZ CORRIDOR
ALTERNATIVE ALIGNMENT



DAHLIA STREET

ENT 2



URBAN OR
DIRECT FLOW
9058 BULL

MATCH LINE SEE FIGURE 4-10

FIGURE 4-1
QUEBECTVA QUEZ CORRIDOR
ALTERNATIVE ALIGNMENTS

QUEBEC STREET/QUEBEC STREET CORRIDOR

Segment 1

This segment extends between the Quebec Street/Vasquez Boulevard corridor south of 112th Avenue to just northwest of I-76.

Alignment A West and Alignment B West. These alignments connect Alignment B of the Quebec Street/Vasquez Boulevard corridor to the Quebec Street/Quebec Street corridor.

Alignment A. This alignment begins approximately 800 feet southwest of a point where Alignment A of the Quebec Street/Vasquez Boulevard corridor turns southwest. It runs southeast, crosses the Platte River, and turns south. Proceeding south, it intersects 104th Avenue and then turns southeast again to the end of the segment.

Alignment B. This alignment begins approximately 800 feet southwest of Alignment A. It immediately turns south and runs between a pair of small lakes, crosses Grange Hall Creek, and runs between another pair of small lakes. The alignment intersects 104th Avenue before crossing two Cooley Gravel Company future lakes. It then crosses the Platte River and runs between another pair of small lakes before turning southeast to the end of the segment.

Alignment C. This alignment begins approximately 3,700 feet southwest of Alignment B. It immediately turns south, intersects 104th Avenue at McKay Road, and then follows the McKay Road alignment. Along McKay Road, Alignment C intersects 100th Avenue, crosses the Platte River, and intersects 96th Avenue before turning more to the southeast to the end of the segment.

Segment 2

This segment begins just northwest of I-76 and extends just south of 88th Avenue.

Alignment A. This alignment continues southeast to cross I-76. It then turns south mainly crossing open fields; intersecting 96th Avenue; crossing the Burlington Ditch, Union Pacific Railroad, and O'Brian Canal; and then intersecting 88th Avenue.

Alignment B. This alignment continues southeast to cross I-76, Burlington Ditch, South Adams County Water and Sanitation District Alluvial Recharge Facility, O'Brian Canal, and Union Pacific Railroad. It then turns south and intersects 88th Avenue.

Alignment C. Alignment C follows Alignment B almost to the Burlington Ditch. It then heads in a slightly more eastern direction crossing the Burlington Ditch, South Adams County Water and Sanitation District Alluvial Recharge Facility, O'Brian Canal, and Union Pacific Railroad. The alignment then turns south and follows Alignment A.

Alignment D. Alignment D coincides with Alignment A until south of the Union Pacific Railroad. It then turns southwest and crosses the O'Brian Canal. It continues in this direction, paralleling the Union Pacific Railroad until it turns south and connects with Alignment B.

Segment 3

This segment extends between 88th Avenue to just south of the Irondale Groundwater Treatment Facility.

Alignment A. This alignment continues south mainly through open land until it crosses the Burlington Northern Railroad and SH 2. The alignment enters the Rocky Mountain Arsenal property and curves southwest through the Irondale Groundwater Treatment Facility. The alignment crosses a railroad spur before the segment ends.

Alignment B. This alignment continues south following the Rosemary Street alignment until it turns southeast removing two residences before it crosses the Burlington Northern Railroad and SH 2. The alignment enters the Rocky Mountain Arsenal property and curves southwest crossing the Irondale Groundwater Treatment Facility. The alignment crosses a railroad spur before the segment ends.

Alignment A Modified. This alignment was added after the Alternative Alignment Analysis task was nearly complete. However, it was learned that there might be serious concerns and potential impacts associated with an alignment going through the Irondale Groundwater Treatment Facility on the Rocky Mountain Arsenal Property. Alignment A Modified coincides with Alignment A to just north of SH 2. Then it roughly parallels Alignment A, approximately 500 feet further to the east. This alignment also crosses a railroad spur near the end of the segment.

When it was learned that an alignment through the Irondale Groundwater Treatment Facility was not feasible, another alignment connecting the Rosemary Street alternative with existing Quebec Street just south of SH 2 was briefly investigated. Such an alternative was soon determined to be unfeasible because it was not possible to fit a desirable alignment from a geometric standpoint in conjunction with a crossing of the Burlington Northern Railroad at this location.

Segment 4

This segment extends from just south of the Irondale Ground-water Treatment Facility to 56th Avenue.

Alignment A. Alignment A turns south and parallels existing Quebec Street approximately 600 feet to the east on the Rocky Mountain Arsenal property. It crosses a railroad spur, and intersects 72nd Avenue and 64th Avenue. It continues south on the Rocky Mountain Arsenal property and curves west to align with existing Quebec Street at approximately 62nd Avenue. It continues due south to the 56th Avenue intersection where the segment ends.

Alignment B. This alignment continues southwest and crosses a railroad spur before it turns south and aligns with existing Quebec Street. It intersects 72nd Avenue, 64th Avenue, and 56th Avenue.

Alignment A Modified. This alignment begins at the end of Alignment A Modified of Segment 3. It angles to the southwest to pass near the southeast corner of the future South Adams County Water and Sanitation District's Water Treatment Plant Site before joining Alignment A at approximately 73rd Avenue.

The following overall alignment alternatives for the Quebec Street/Quebec Street corridor are indicated by the segment number and alignment letter designation:

- o Alternative 1A-2A-3A*-4A*
- o Alternative 1A-2A-3A*-4B
- o Alternative 1A-2D-3B-4A*
- o Alternative 1A-2D-3B-4B
- o Alternative 1B-2C-3A*-4A*

- o Alternative 1B-2C-3A*-4B
- o Alternative 1B-2B-3B-4A*
- o Alternative 1B-2B-3B-4B
- o Alternative 1C-2C-3A*-4A*
- o Alternative 1C-2C-3A*-4B
- o Alternative 1C-2B-3B-4A*
- o Alternative 1C-2B-3B-4B

Figures 4-12 through 4-15 show the Quebec Street/Quebec Street corridor alignment alternatives.

COLORADO BOULEVARD/YORK STREET CORRIDOR

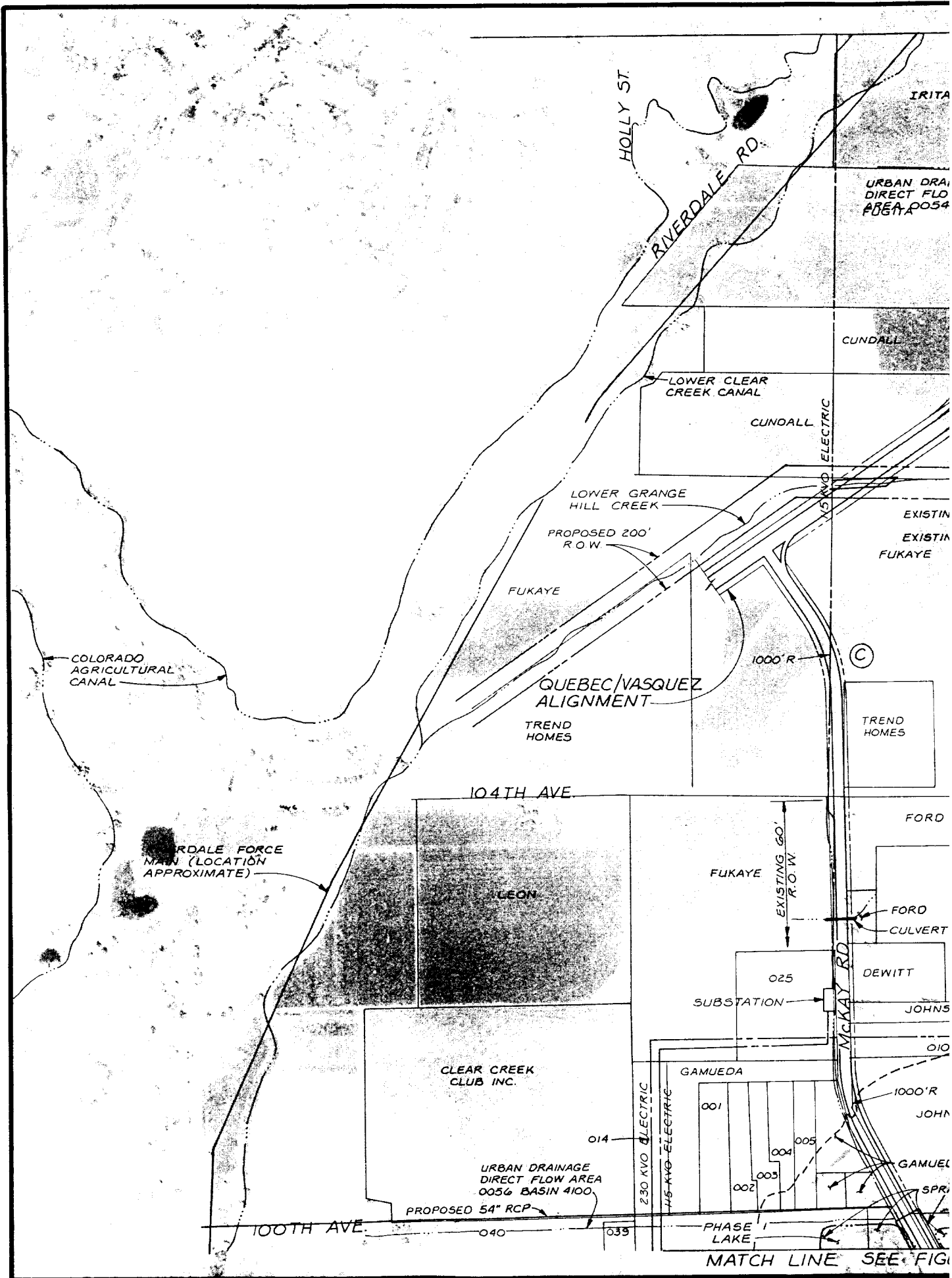
Segment 1

This segment extends between 88th Avenue at Colorado Boulevard to just southwest of the Union Pacific Railroad and the projected alignment of 80th Avenue.

Alignment A. This alignment heads south of 88th Avenue at Colorado Boulevard for approximately 1,000 feet, then angles southwest. It then follows the Public Service right-of-way, between a reclaimed gravel mining lagoon and a current gravel mining excavation until it angles westerly to intersect Steele Street and crosses the Union Pacific Railroad. The alignment crosses Niver Creek before the end of the segment.

Alignment B. Alignment B also heads south of 88th Avenue at Colorado Boulevard for approximately 1,000 feet, then angles southwest until it turns south approximately 800 feet east of Steele Street, and runs along the west side of a reclaimed gravel mining lagoon. It continues south until it turns

* Indicates Modified Alignment.



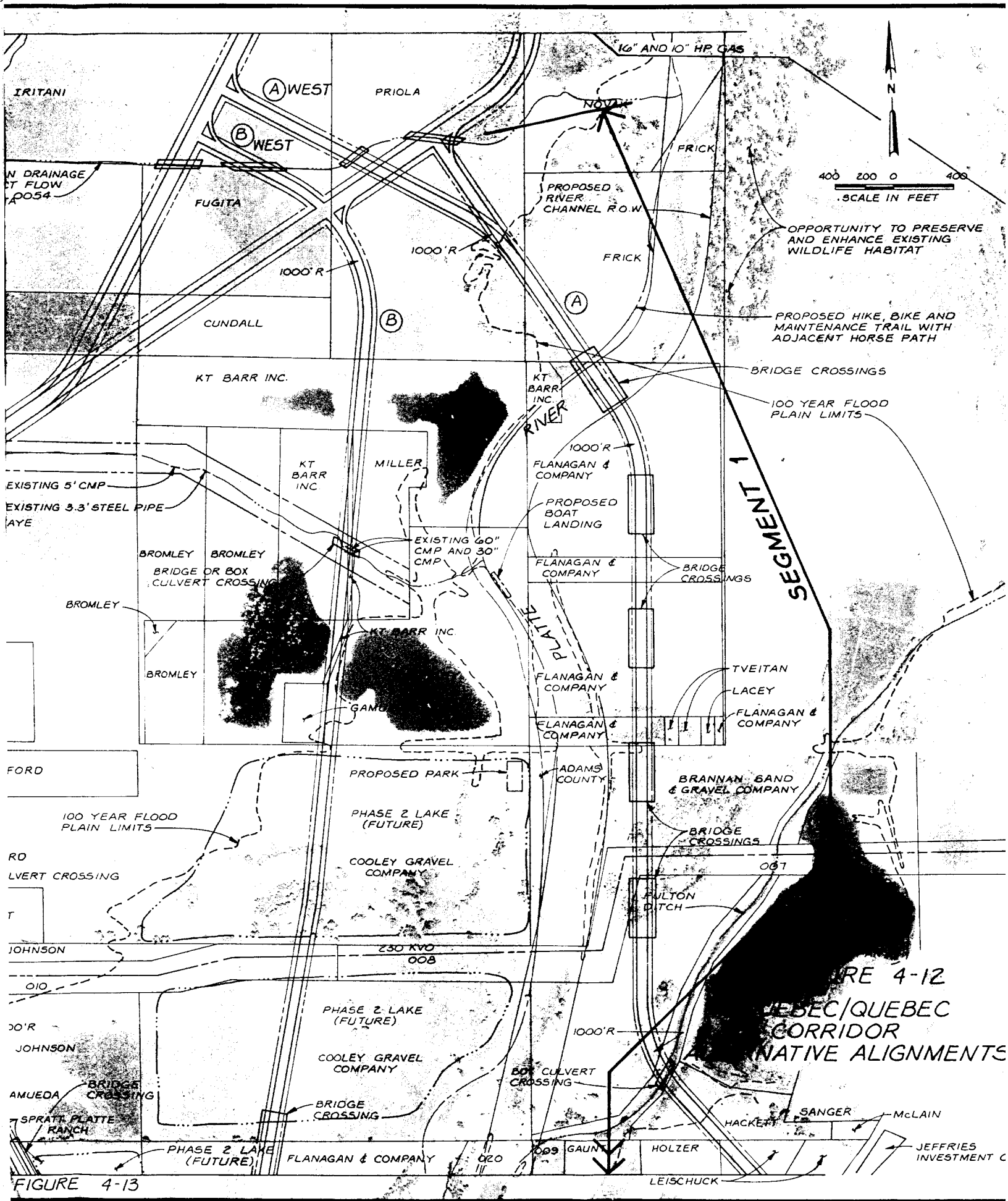
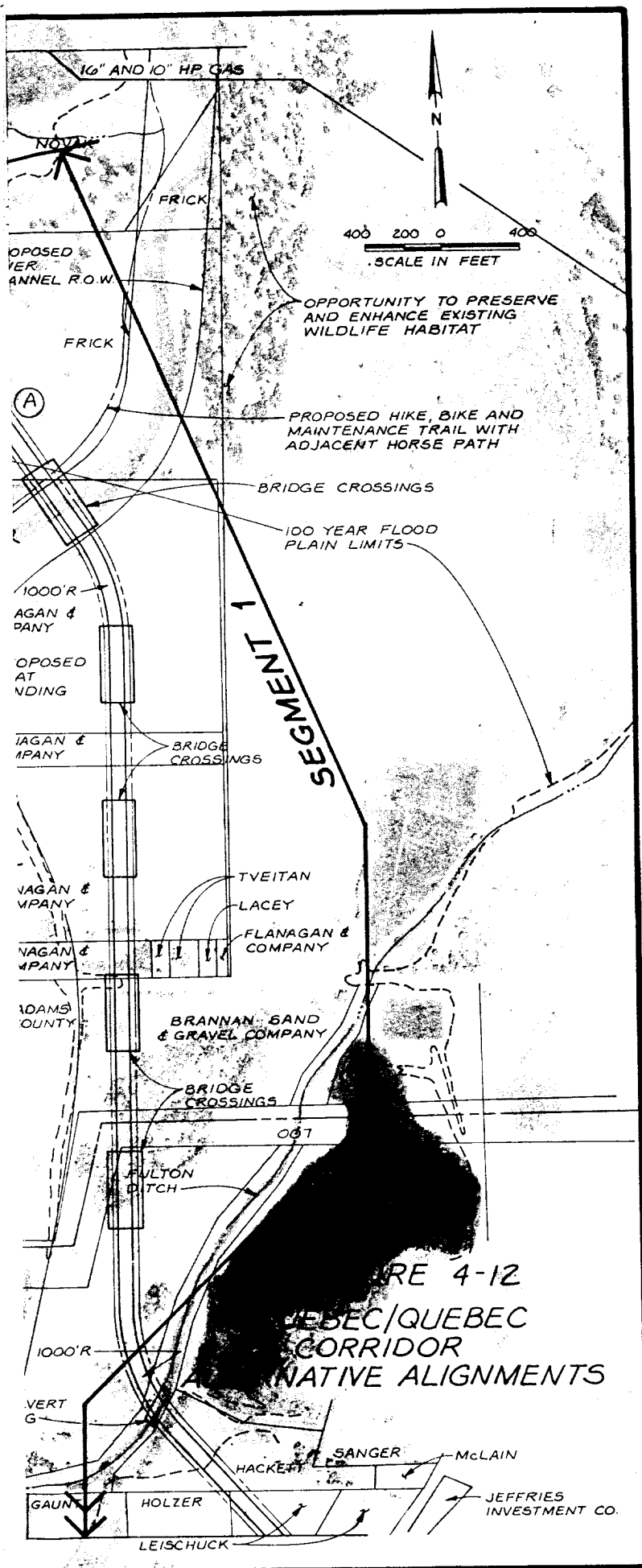


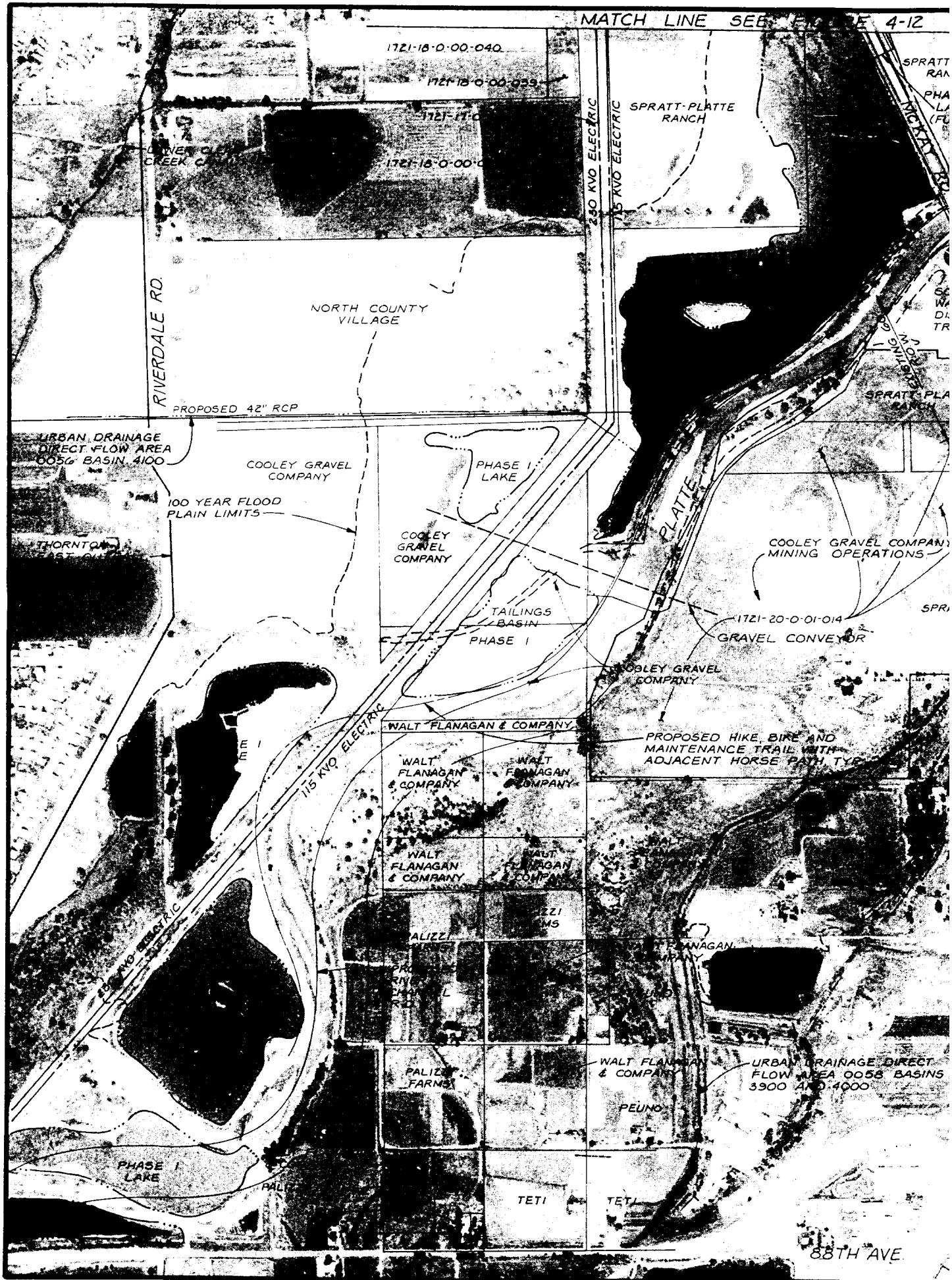
FIGURE 4-13

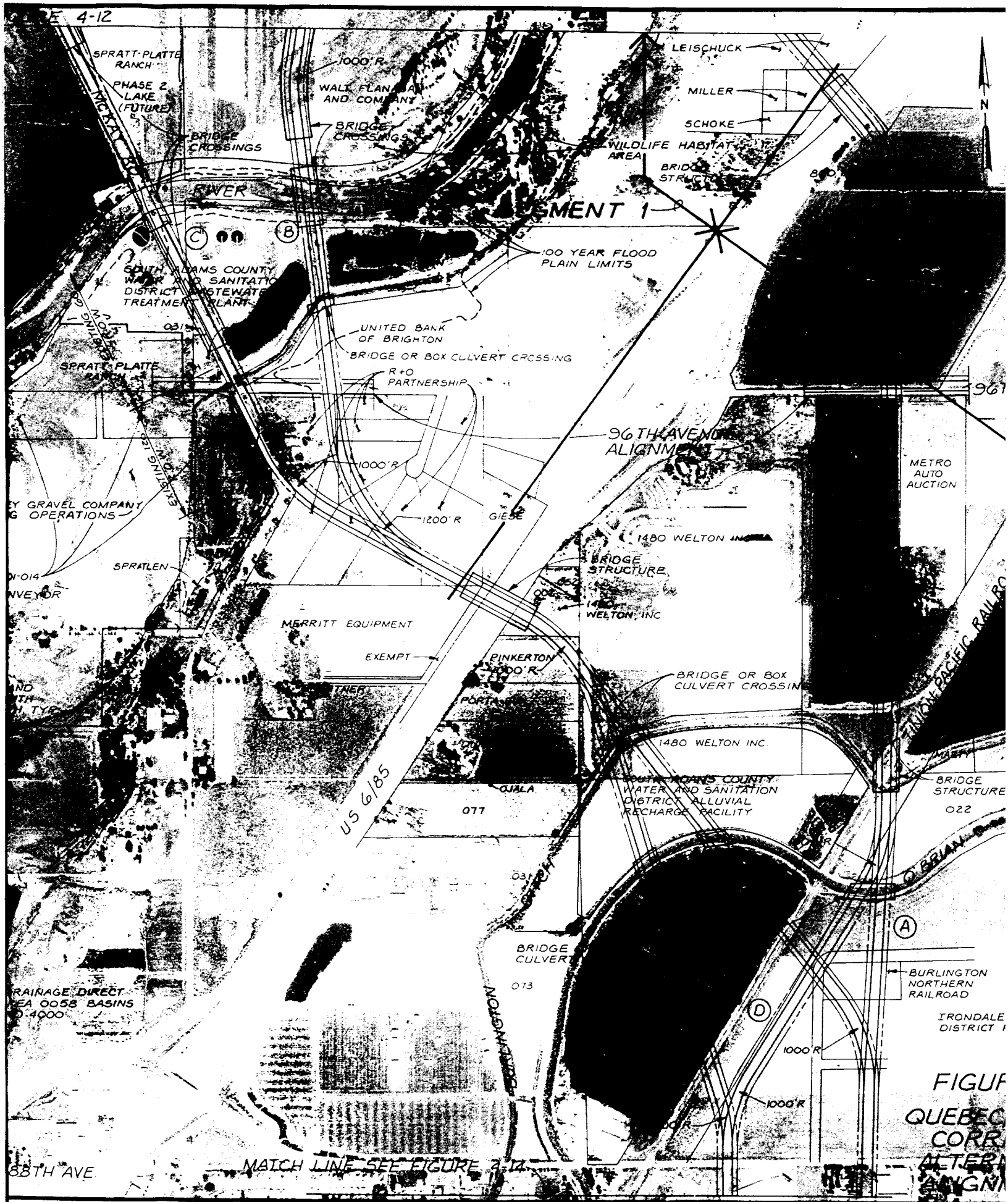
FIGURE 4-12

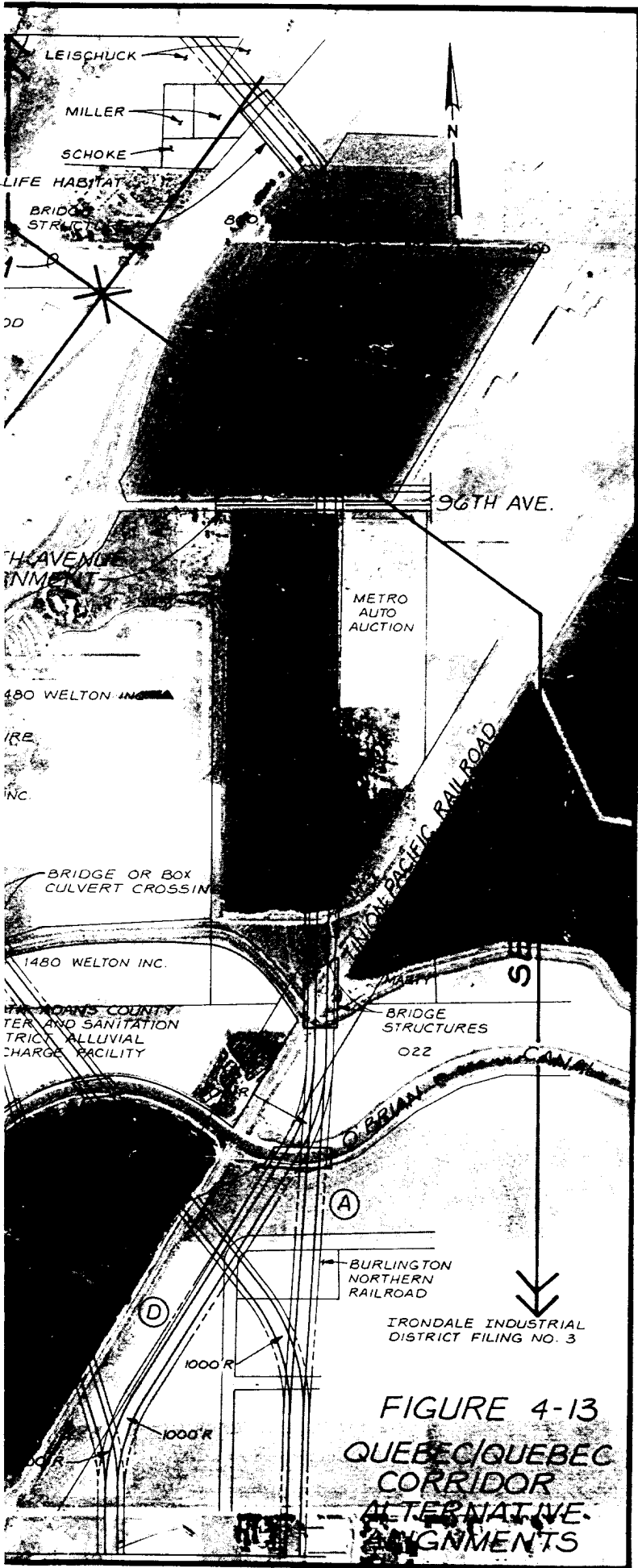
QUEBEC/QUEBEC CORRIDOR ALTERNATIVE ALIGNMENTS

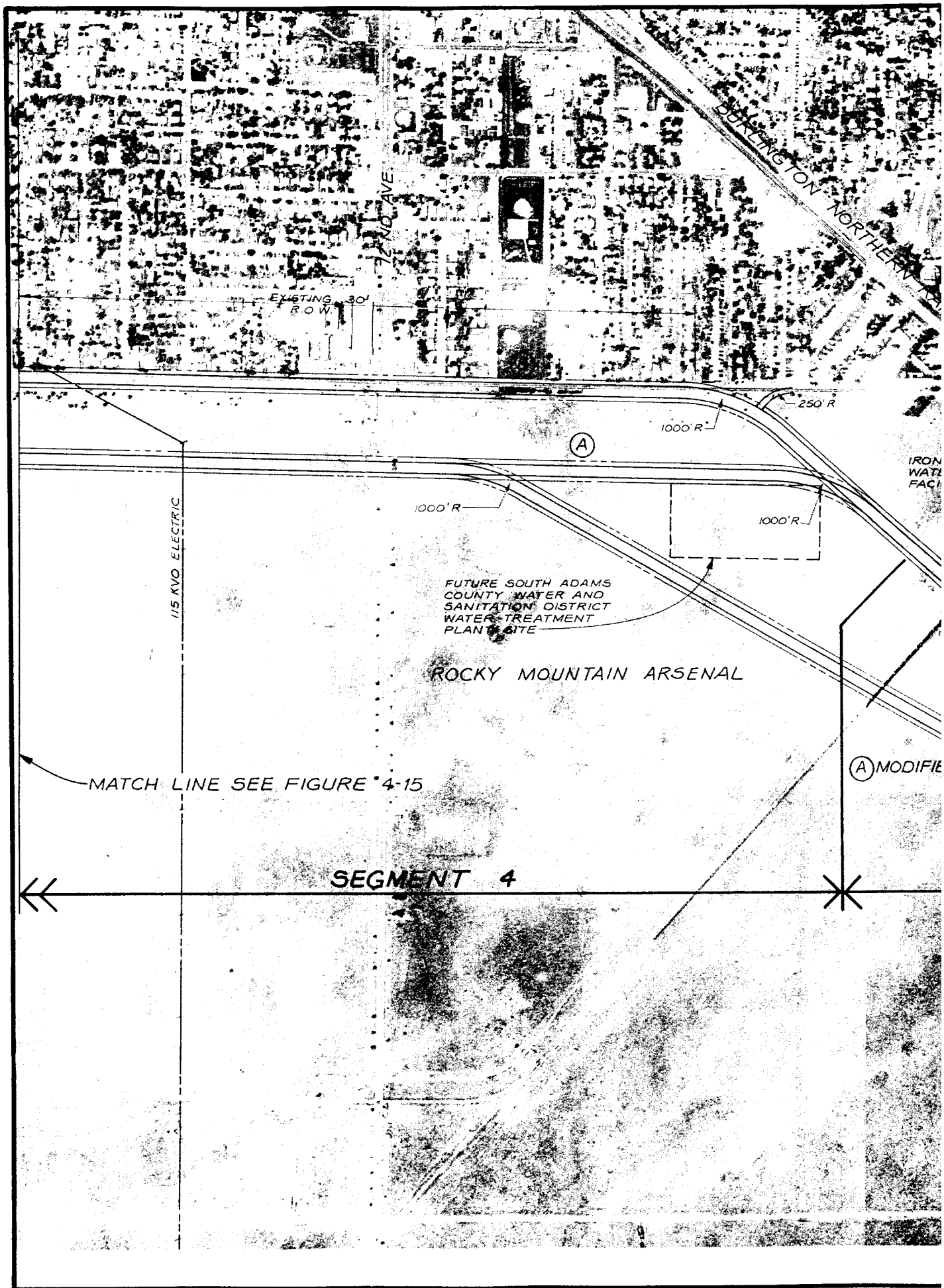


MATCH LINE SEE FIGURE 4-12









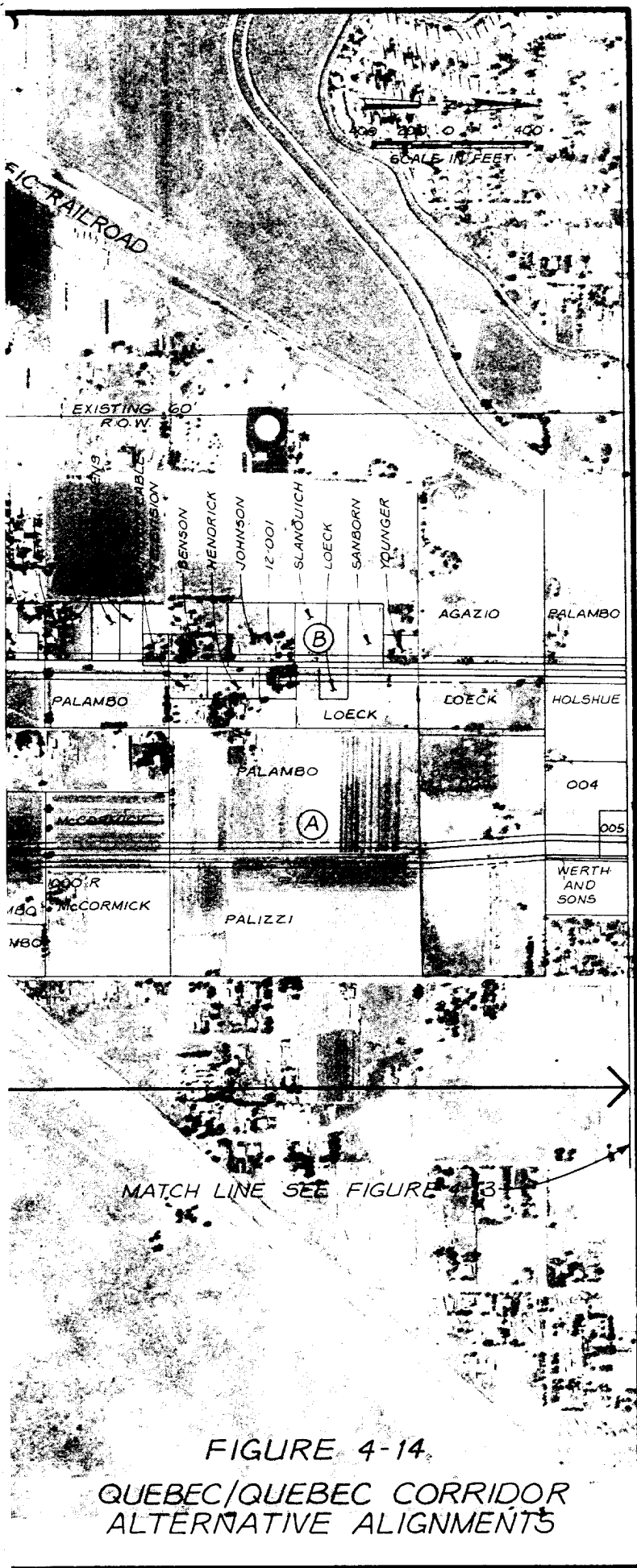
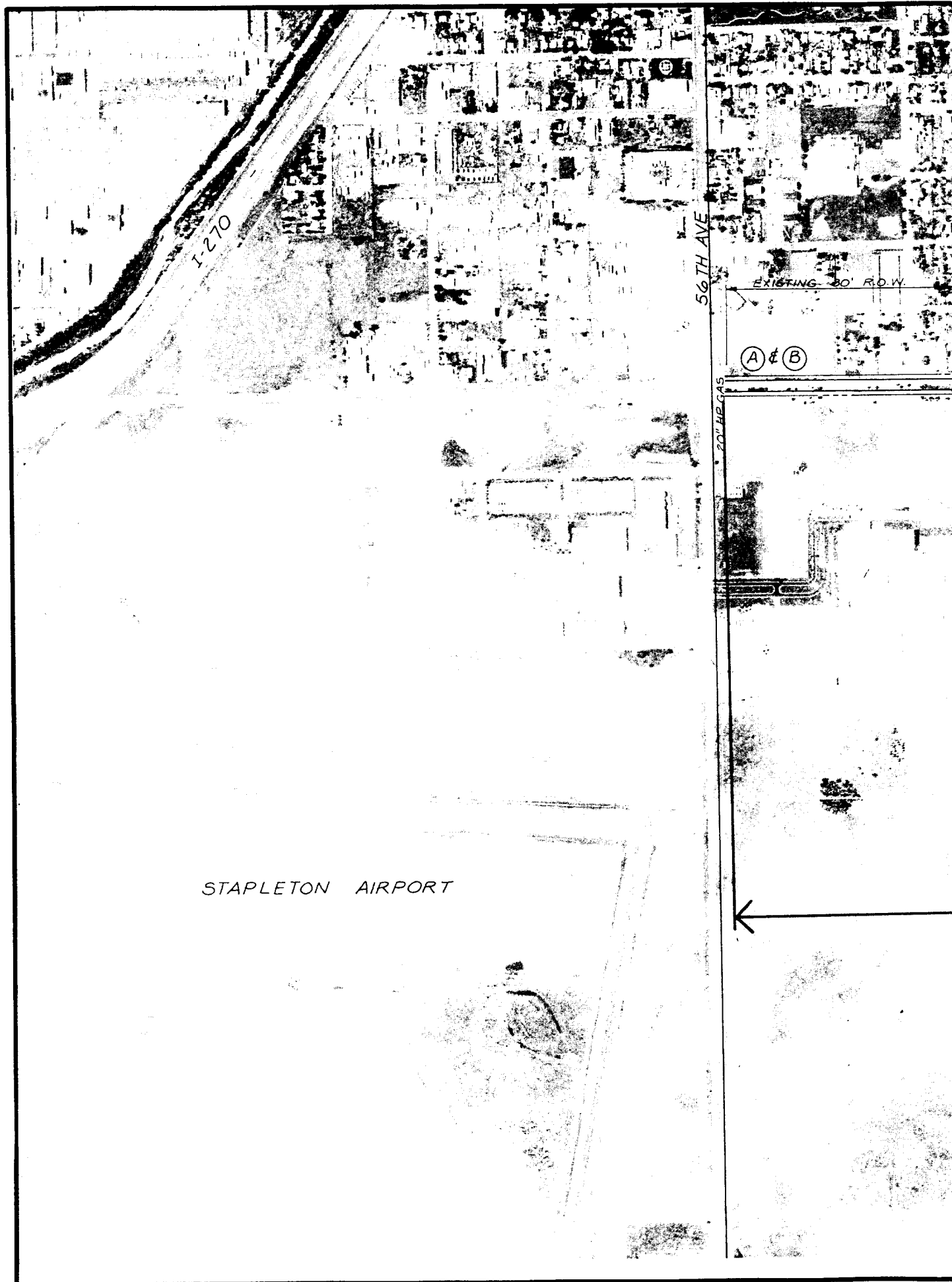


FIGURE 4-14.

QUEBEC/QUEBEC CORRIDOR
ALTERNATIVE ALIGNMENTS



STAPLETON AIRPORT

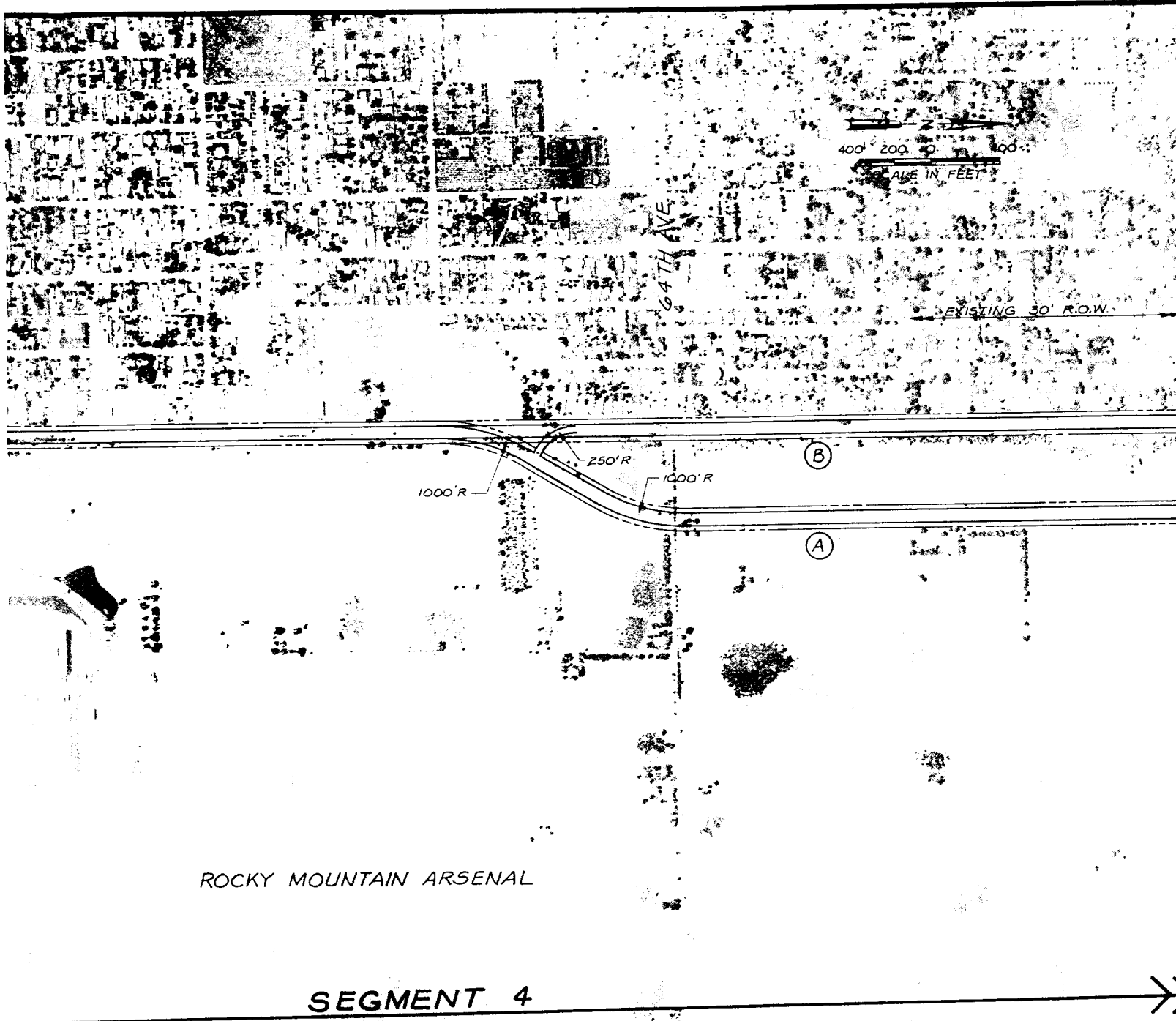
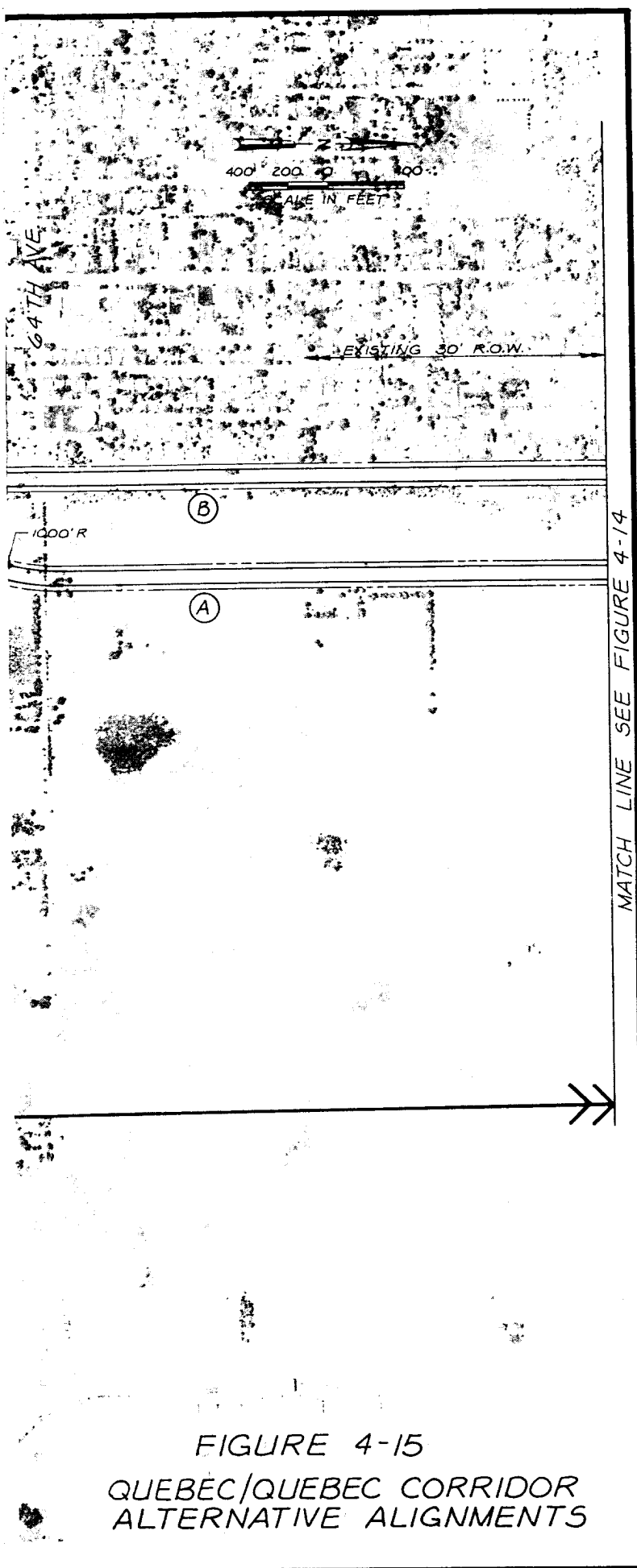


FIGURE 4-15
QUEBEC/QUEBEC CORRIDOR
ALTERNATIVE ALIGNMENTS



southwest to intersect Steele Street. The alignment continues to the end of the segment and crosses the Union Pacific Railroad and Niver Creek.

Alignment C. This alignment heads south approximately 1,000 feet and angles southwest until it intersects Steele Street. It then follows Steele Street south until it turns southwest to cross the Union Pacific Railroad and Niver Creek.

Segment 2

This segment extends between the Union Pacific Railroad and the projection of 80th Avenue to York Street and 74th Avenue.

Alignment A. This alignment turns south and runs through open land until it turns southwest and aligns with York Street approximately 700 feet north of 74th Avenue.

Alignment B. This alignment continues southwest crossing through the U-Haul property where it aligns with York Street approximately 1,800 feet north of 74th Avenue.

The overall alignment alternatives for the Colorado Boulevard/York Street corridor indicated by the segment number and alignment letter designation are the following:

- o Alternative 1A-2A
- o Alternative 1A-2B
- o Alternative 1B-2A
- o Alternative 1B-2B
- o Alternative 1C-2A
- o Alternative 1C-2B

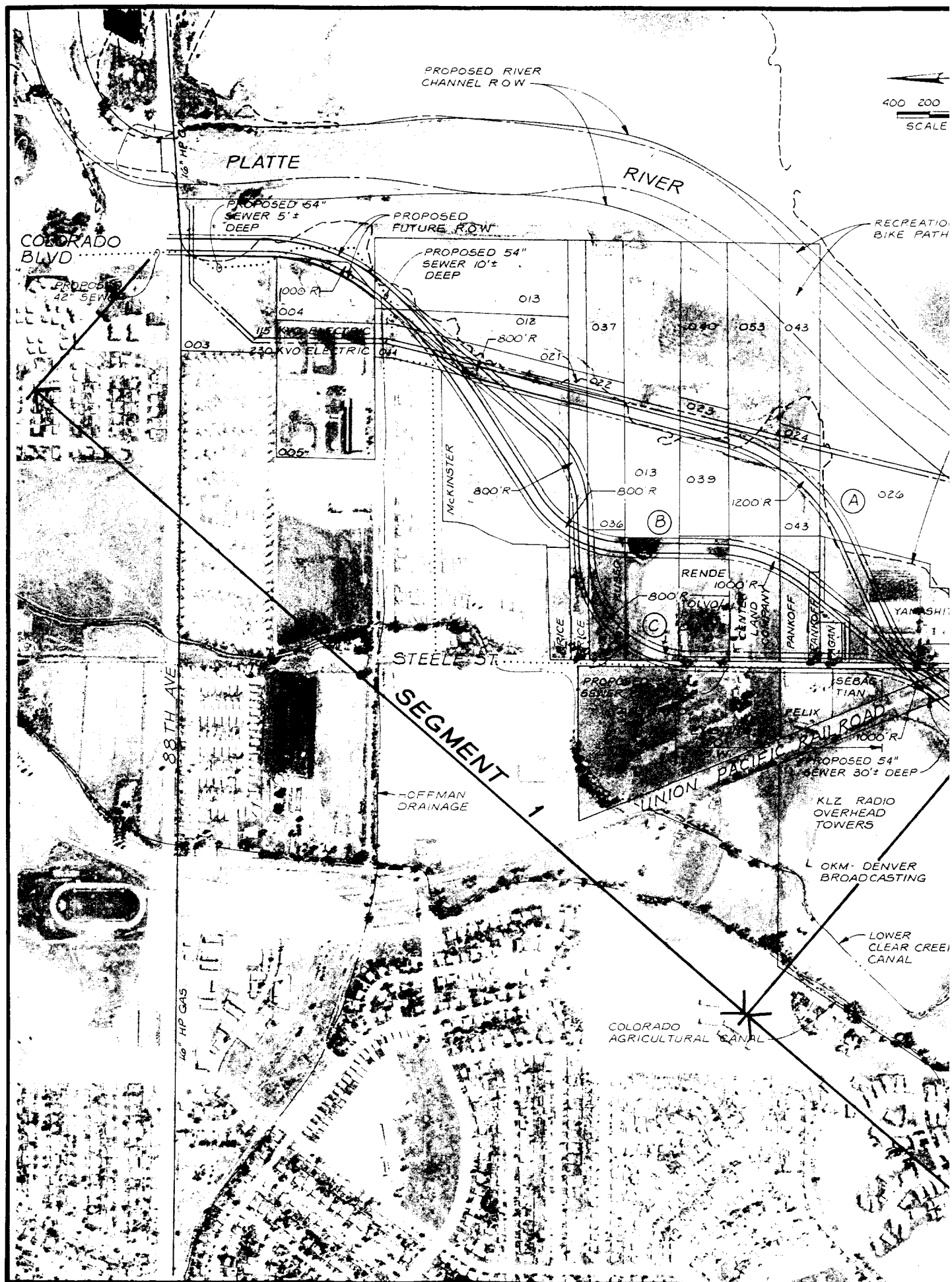
Figure 4-16 shows the Colorado Boulevard/York Street corridor alignment alternatives.

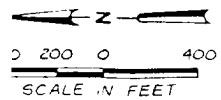
ALTERNATIVE ALIGNMENT EVALUATION CRITERIA

The feasible alternative alignments identified for each of the four study corridors were compared and evaluated based on a set of criteria developed for this study. This set of criteria consists of traffic considerations, residential impacts, commercial impacts, roadway geometrics, environmental impacts, recreation potential, construction costs, right-of-way requirements, and other issues such as roadway network compatibility and phasing ability. These criteria were chosen because they provide a comparative analysis of the feasible alternative alignments within a study corridor. Each of these criteria is described in more detail as follows.

Traffic--This criterion consists of the overall LOS provided by a given alignment alternative from a traffic flow standpoint. For evaluating the alternative alignments for this study, all of the alignments will provide an overall LOS C or better as was indicated in the Transportation System Analysis task section.

Residential Impacts--This criterion was used to evaluate the relative impacts of the alternative alignments on residential properties. For each alternative, the number of houses within 200 feet, 300 feet, and 500 feet of the roadway back of curb, was tabulated. It was determined that an alternative has high impact on houses within 200 feet of the back of curb, moderate impact on houses within 300 feet of the back of curb, and minor impact on houses within 500 feet of the back of curb. At locations where an alternative passes through existing houses or comes to within 100 feet of a





REGIONAL HIKE
E PATH

100 YEAR FLOOD
PLAIN LIMITS

YAMASHITA
1000'
BRIDGE OR BOX
CULVERT CROSSING
YAMASHITA
BRIDGE CROSSING
1000' R

COSIMI
COSIMI
RITKOGSKI
COSIMI
GREEN AND
HENKE
COSIMI
COSIMI
CANAL - ADAMS COUNTY
CREEK
AL

DISNER (A)
D. MANNA
600' R
BRANNAN SAND & GRAVEL
BRANNAN SAND & GRAVEL

(B)
TOLVO
D. TULLIO
MILORD
U-HAUL
KARZUCA
DURSEY
KAR-GO SERVICE
PONZIO
LORENZO
SANDY INVESTMENT CO.
HUFFSMITH
FIORE
FIORE

CIANCIO
DEPUE
WEAVER ANDERSON
CIANCIO
ROTELLO
EXISTING 120' R.O.W.
STORAGE EQUITIES

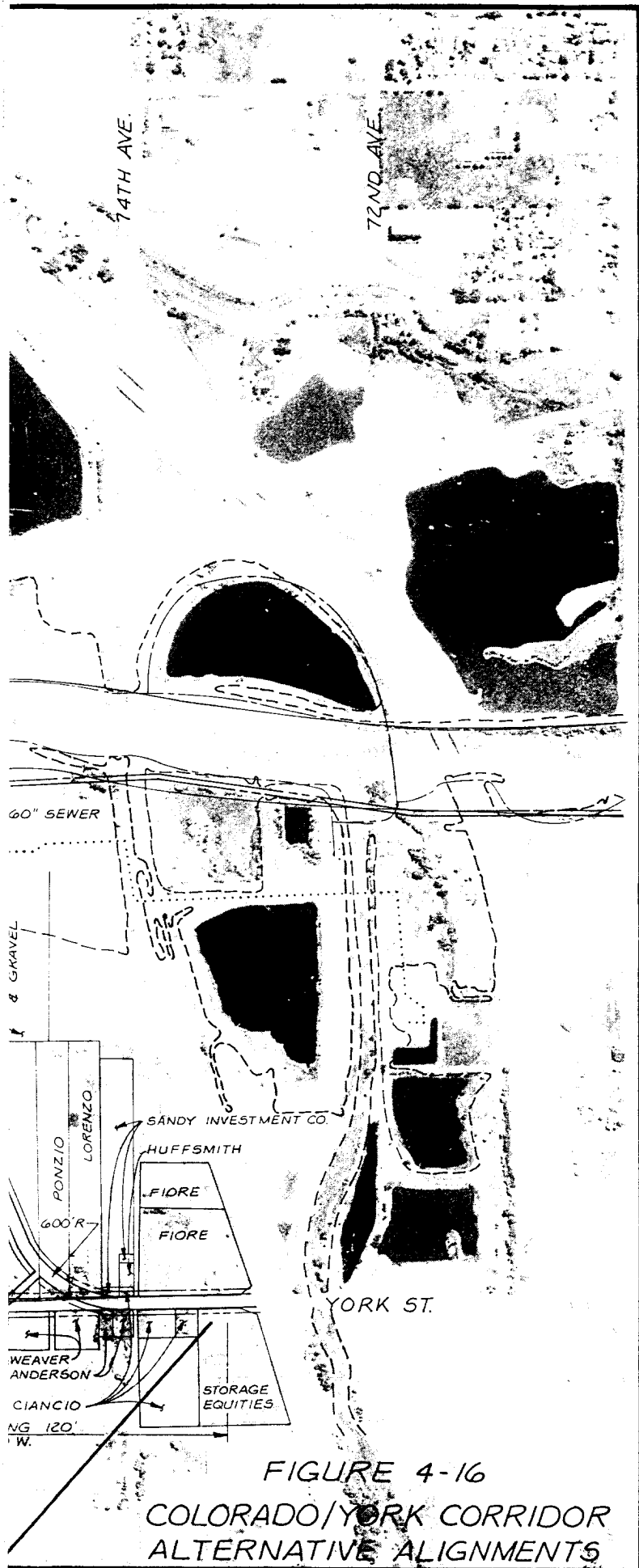
74TH AVE.

72ND AVE.

YORK ST.

SEGMENT 2

FIGURE 4-16
COLORADO/YORK CORRIDOR
ALTERNATIVE ALIGNMENT



house (measured from back of curb) where no roadway previously existed, residential "relocations" were identified. These were considered to be the highest type of impact an alternative can have on a residential property.

Commercial Impacts--This criterion addresses the relative impacts of the alternative alignments on commercial properties. To quantify this, the number of commercial properties from which right-of-way must be acquired were tabulated for each alternative. Also, where businesses would have to be relocated because of conflict with an alternative, commercial relocations were identified. As with residential relocations, commercial relocations were considered to be the highest type of impact on a commercial property.

For some of the alternatives it was determined that certain commercial properties would be benefited rather than negatively impacted by the alternative. This would primarily occur if the alternative would provide improved access or more exposure to the business. The locations benefited were also tabulated.

Horizontal Roadway Geometrics--This is a measure of how an alternative meets the applicable design criteria based on its given design speed. Primarily addressed by this criteria are horizontal curvature and intersection approach geometry. To quantify this criteria, each alternative was assigned a relative rating indicating whether it meets or exceeds the minimum requirements for its design speed.

Environmental Impacts--From an environmental standpoint, this criterion measures the relative impacts of the alternative alignments on existing wetlands, woodlands, and wildlife habitats. The relative rating assigned to each alternative is based on the findings of an investigation

performed to identify these environmental impacts. A discussion of this investigation is included at the end of this section.

Recreation Potential--This criterion measures how well an alternative fits in with and provides access to nearby existing or planned recreation facilities in the vicinity of the alternative. The findings of an investigation performed to identify recreation potential of the alignment alternatives are included at the end of this section.

Construction Costs--Conceptual level opinions of construction costs were prepared in 1988 dollars for the alignment alternatives in each corridor. These costs include costs of pavement, curb and gutter, bikepath, sidewalk, earthwork, median, and buffer area landscaping, lighting, and traffic signals for the typical roadway section identified for each corridor. At intersections, the costs of a widened pavement section to account for turning lanes were included. Also included in the construction costs were approximate costs of bridge structures, box culverts, other major drainage crossings, storm drainage systems, and other miscellaneous costs such as costs to relocate electrical towers. These costs were determined only as a means to compare the alignment alternatives and were not intended to be definitive costs for budgeting or any other purposes. Right-of-way costs were not included in this conceptual level opinion of costs.

Phasing Ability--This criterion deals with how well a particular alternative lends itself to being built in phases as traffic volumes warrant construction of various segments along the alignment. This criterion also has to do with whether the alternative contains reasonable links that tie into the existing transportation network allowing portions

of existing roadways to be used until the ultimate alignment is completed.

Roadway Network Compatibility--This criterion measures how well an alternative fits in with other existing or planned roadways in the general vicinity and how well it helps to relieve traffic demands on other facilities to equalize traffic flow and reduce congestion.

EVALUATION MATRIX

Each of the alignment alternatives for the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, and Colorado Boulevard/York Street corridors was evaluated based on the evaluation criteria previously described. To aid in the comparison and recordkeeping for the various alternatives, a computerized evaluation matrix was developed for each corridor. Tables 4-1 through 4-4 show the evaluation matrices. Along the left side of each matrix, the alternative alignments in the corridor are listed. Across the top of the matrix, the basic evaluation categories of Traffic Considerations, Residential Impacts, Commercial Impacts, Roadway Geometrics, Environmental Impacts, Construction Costs, Right-of-way Requirements, and Other Issues are listed. Within each overall evaluation category, one or more criteria are listed to include all of the evaluation criteria previously described. Also, within each of the overall categories that has more than one evaluation criteria, is a tabulation of a composite rating for the overall category and a ranking of the alternatives with a number 1 indicating the most desirable alternative within that category.

To complete each matrix, the relative ratings, numbers tabulated, and costs were input as follows: under the first

Table 4-1

4-41

Table 4-2

4-42

Table 4-3
QUEBEC STREET/QUEBEC STREET ALTERNATIVE ALIGNMENT MATRIX

ALTERNATIVE	TRAFFIC			RESIDENTIAL			COMMERCIAL			GEOMETRICS		
	OVERALL	RANKING	MINOR	HIGH	RELOCATION	COMPOSITE	RANKING	RELOCATION	COMPOSITE	RANKING	MINOR	RANKING
1A-2A-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1
1A-2A-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1
1C-2C-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1
1C-2C-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1
1B-2C-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1
1B-2C-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1
1A-2D-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1
1C-2B-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1
1A-2D-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1
1C-2B-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1
1B-2B-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1
1B-2B-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1

ALTERNATIVE	ENVIRONMENTAL			RECREATION			COSTS			RIGHT-OF-WAY			OTHER ISSUES			SUMMARY		
	RELATIVE	RANKING	POTENTIAL	RECREATION	RANKING	POTENTIAL	CONCEPTUAL	RANKING	CONSTRUCTION	ADDITIONAL	RANKING	PHASING	ROADWAY	COMPOSITE	RANKING	COMPOSITE	FINAL	RANKING
1A-2A-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1A-2A-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1C-2C-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1C-2C-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1B-2C-3A-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1B-2C-3A-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1A-2D-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1C-2B-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1A-2D-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1C-2B-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1B-2B-3B-4A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1B-2B-3B-4B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

NOTE: ALIGNMENTS 3A AND 4A ON THIS TABLE REFER TO ALIGNMENTS 3A-MODIFIED AND 4A-MODIFIED.

Table 4-4
COLORADO BOULEVARD/YORK STREET ALTERNATIVE ALIGNMENT MATRIX

[illegible]

overall category, "Traffic" (for Overall LOS), each alternative was assigned a "1" since each alternative meets or exceeds the desired LOS of C. Therefore, each of the alternatives received a ranking "1" in the overall Traffic category. For the next overall category, "Residential," the number of locations where an alternative has minor, moderate, or high impacts on a property (as defined under evaluation criteria) or where a residence will be relocated were tabulated. To account for increasing severity, the number of minor impacts were multiplied by a factor of 1, moderate impacts by a factor of 2, high impacts by a factor of 4, and relocations by a factor of 10 as indicated in the matrix headings. Composite impacts of the alternatives were calculated, and the alternatives were ranked based on their impacts to residential properties. Thus, the lower the number, the less an alternative impacts residential properties.

For the "Commercial" category, the number of properties from which right-of-way will be acquired was tabulated. Commercial relocations were also tabulated and were multiplied by a factor of 5, indicating that the impact of a relocation is much greater than for right-of-way acquisition. Where it was determined that an alternative would benefit certain properties by giving them more desirable access or visibility, benefit locations were tabulated. These were multiplied by a factor of minus 1 (-1), which indicates that the benefit will counteract the fact that right-of-way must be acquired from the property owners. Composite commercial impacts were tabulated for each alternative, and the alternatives were ranked in order of increasing commercial impacts.

For the "Geometrics" category, each segment of an alternative was given a rating from 1 to 5 to quantify how well it meets the horizontal curvature requirements for its design speed and how desirable its intersection approach angles are. A rating of "1" indicates that an alternative has

horizontal curve radii that exceed the minimum curve radii for the design speed by a considerable amount and its intersections are at 90-degree angles or a small skew angle. A rating of "5" indicates that an alternative meets the minimum curve radii for its design speed, and that it has intersection skew angles in the range of 30 degrees. The ratings for the segments of an alternative were added to give an overall rating for the alternative. The alternatives were then ranked, with the lowest number corresponding to the alternative with the most desirable horizontal geometrics.

For the "Environmental" category, the length of roadway impacting existing wetlands, wildlife habitats, and woodlands was estimated for each alternative. Wetlands were subcategorized into wetlands and seasonal wetlands. Woodlands were subcategorized into riparian woodlands and cultural woodlands. To account for the increasing severity and mitigation required, lengths of wetlands impacts were weighted by a factor of 3 and lengths of seasonal wetlands impacts were weighted by a factor of 2. Lengths of impacts on riparian woodlands, cultural woodlands, and wildlife habitats were multiplied by a factor of 1. The weighted lengths from each category were summed for each alternative. The lowest sum of lengths indicates the least environmental impact. The alignments were then ranked with a "1" corresponding to the alignment with the least environmental impacts.

Under the "Recreation" category, relative recreation benefits were analyzed. Where benefits could be realized, a rating of "1" for the most benefits ranging to a "5" for the least benefits were input for each alternative. The alternatives were then ranked in order of benefits with a "1" corresponding the most benefits.

Under the "Costs" category, construction costs of the items identified in the previous discussion of the evaluation criteria were tabulated for each alternative. The alternatives were then ranked in order of ascending construction costs with a "1" corresponding to the lowest construction cost.

Under the "Right-Of-Way" category, square footage of right-of-way required was tabulated for each alternative. The alternatives were ranked for this criterion in order of ascending right-of-way needs.

Under "Other Issues", each alternative was given two cumulative ratings based on its phasing ability and its roadway network compatibility. Again, these ratings are the summation of the 1 to 5 ratings for the alternatives segments. A composite "Other Issues" ranking was developed. Finally, for each corridor, an overall ranking of the alternatives was developed with a ranking of "1" denoting the recommended alignment. The recommended alignments are presented in detail in the following section.

PUBLIC INVOLVEMENT AND COORDINATION

During the course of the study, meetings were held to inform the public and agencies having transportation responsibilities in the area of the status of the study and to solicit input and concerns. Two public meetings were held to inform the public of the project and to solicit comments and input. The input from citizens at public meetings and agency representatives at technical review meetings was used to help develop and adjust the evaluation criteria.

For the public meetings, citizens owning property in the vicinity of the alignment alternatives were sent notices to

inform them of the meetings. At these meetings, CH2M HILL made presentations on the project status with accompanying visual aids. The first meeting was held in Thornton on December 10, 1987, after the preliminary alignment alternatives were developed. The second meeting was held in Commerce City on February 11, 1988, after preliminary recommendations on the preferred alignment for each corridor were made. Sign-in sheets of those attending the public meetings are included in the Appendix of this report.

Upon completion of the study, CH2M HILL made three presentations, one each before elected officials of Adams County, Commerce City, and the City of Thornton.

A Technical Committee was also organized for the study. This committee included representatives of Adams County, Commerce City, the City of Thornton, the Colorado Department of Highways, the Denver Regional Council of Governments, the Department of the Army, Urban Drainage and Flood Control District, and CH2M HILL. Table 4-5 shows the committee members and their areas of input to the study.

The purpose of the Technical Committee was to coordinate the study with federal, state, and local jurisdictional agencies. Four meetings of the committee were held to discuss project status and solicit input concerning planning issues in the study area. Jurisdictional requirements of the agencies were also discussed. Review letters documenting the final comments of these agencies with respect to this study are included in the Appendix of this report.

Meetings were held approximately every 2 weeks between the CH2M HILL team and the Adams County, Commerce City, and City of Thornton representatives to facilitate execution of the project. Some of these meetings were held in conjunction with the Technical Committee meetings.

Table 4-5
TECHNICAL COMMITTEE MEMBERS AND AREAS OF INVOLVEMENT

<u>Agency</u>	<u>Representative</u>	<u>Area of Involvement</u>
Colorado Department of Highways (CDOH)	Gary Prentiss	Interface of recommended and alternative alignments with existing and planned CDOH facilities
Denver Regional Council of Governments (DRCOG)	Jeff May John Coil	Interface of recommended alignments with DRCOG's Regional Year 2010 Plan
Department of the Army	Jim Green	Issues associated with the Rocky Mountain Arsenal in conjunction with recommended and alternative roadway alignments
Urban Drainage and Flood Control District	Bill DeGroot	River Crossings, Major Drainage- way, and Flood Plain Issues associated with the recommended and alternative alignments
Adams County	Rocky Carns Candace Stowell	Overall Study
City of Thornton	Gene Putman Jane Harris	Overall Study
Commerce City	Steve House Gregg Clements	Overall Study
CH2M HILL	Tom Ragland Chris Bisio	Overall Study

IMPACTS TO WETLANDS, WOODLANDS, AND WILDLIFE HABITATS

This subsection analyzes the impacts of the various alternative roadway alignments on wetlands, woodlands, and wildlife habitats for each of the four study corridors. It is an overview investigation for alternative comparisons only. Further investigations will be necessary in preliminary and final design phases for each corridor. Summarized below are the methodology and findings that reveal which roadway alternatives might be preferable with regard to these impacts. A table that identifies all apparent impact areas is also included.

ENVIRONMENTAL IMPACT ANALYSIS METHODOLOGY

Aerial photographs at a scale of 1"=400' showing the alignment alternatives were used for this investigation. Each alternative was analyzed according to its linear footage of potential impact on four kinds of wetlands or woodlands. For the purpose of this study, precise definitions of wetland edges were not made. Nor was it defined what amount of earthwork and subsequent impact each roadway may create. Therefore, for comparison's sake, each alternative was evaluated on only the linear footage of roadway potentially impacting a given wetland or woodland area. The types of wetland or woodland areas were broken down into four typical conditions found in the study corridors.

1. Wetlands--Often a part of or near water bodies, in a year-round saturated condition. These support vegetation typical of riparian or marsh conditions. Wetlands are important ecologically because of their ability to retain stormwater runoff, filter pollutants from runoff, act as groundwater recharge areas, and support a diversity of vegetation and wildlife.

2. Riparian Woodlands--These are often wetlands, which are usually comprised of an association of cottonwoods, willows, and a large variety of shrubs and herbaceous vegetation. In the high plains of Colorado, these areas are the only significant natural occurring woodlands. They are important for their wildlife habitats, soil stabilization, and as parks or open space resources.
3. Seasonal Wetlands--These are primarily irrigation canals. Although manmade, these ditches take on many of the characteristics of riparian woodlands with large trees and a variety of vegetation and wildlife. The absence of water in the winter months, however, does diminish their "wetland" effect.
4. Cultural Woodlands--These are manmade landscapes. For the purposes of this study, cultural woodlands denote major tree plantings, primarily older trees, which are difficult to replace. Tree-lined roadways are community resources that are often not given up for roadway improvements. In addition, the removal and replacement of these plantings can significantly add to the cost of the roadway.

Wildlife habitats are another type of impact directly related to wetlands and woodlands. Although not specifically noted, all of the above wetland or woodland areas are notable wildlife habitats. The quantity and variety of wildlife are directly related to the diversity of vegetation and availability of water. To varying degrees, the impact areas described in this section most often support more wildlife than adjacent areas. An exception to this is prairie dog towns, which are located away from wetlands or woodlands where there is prairie or meadow vegetation and well-drained soil. The presence of prairie dog towns also indicates the

remote possibility of black-footed ferret habitat. The black-footed ferret is a rare and endangered species. The Quebec Street/Quebec Street corridor may have a prairie dog habitat at the Rocky Mountain Arsenal. The issue of the black-footed ferret habitat in this area needs to be further examined during preliminary and final design phases for the corridors.

The major wildlife habitat in the project study area is the area adjacent to the South Platte River. These wetlands and riparian woodlands may provide habitat for threatened and endangered species such as the bald eagle and whooping crane. A more detailed assessment of this potential should also be examined during preliminary and final design phases for the corridors.

FINDINGS

Quebec Street/Vasquez Boulevard Corridor

The most significant potential impact in this corridor is the crossing of the South Platte River and associated wetlands or woodlands. Alternative A in Segment 2 would potentially impact the most linear feet of wetlands (1,000 linear feet) whereas Alternative B potentially impacts 300 linear feet. In the South Platte River area, alternatives A and B could impact 700 and 800 linear feet of riparian woodlands, respectively.

Another significant impact in this corridor is on cultural woodlands at the North County Village Subdivision and an area just north of I-76. A total of 1,700 linear feet of potential impacts would occur in these areas where Alternatives 2A and 2B coincide.

Quebec Street/Quebec Street Corridor

In Segments 1 and 2, with all wetland/woodland impacts taken into consideration, Alternative Alignments 1C and 2C have the least potential impacts. The most significant impact area for all alternatives in Segments 1 and 2 is where the South Platte River crossings occur. Alternative 1C uses the existing McKay Road crossing and passes through the existing South Adams County Treatment Plant, whereas Alternative 1A impacts the greatest amount of wetland and riparian woodlands.

In Segments 3 and 4, the major potential impacts are to cultural woodlands in the form of established tree plantings along existing Rosemary Street north of SH 2 and to existing Quebec Street south of SH 2. In these areas, Alternatives 3A and 4A would have less potential impacts than would Alternatives 3B and 4B.

96th Avenue Corridor

In Segment 1, Alternative 1B minimizes the impact to both the South Platte River wetlands and also to the cultural woodlands at the North County Village Subdivision.

In Segment 2, Alternatives 2B and 2C could impact wetlands at First Creek.

Colorado Boulevard/York Street Corridor

In Segments 1 and 2, Alternative Alignments 1A and 2A have no apparent significant wetland or woodland impacts. However, minor wetland impacts could occur where the 1A, 1B, and 1C alternatives coincide near the Union Pacific Railroad tracks. In Segment 1, Alternative 1C has the most potential

impacts to cultural woodlands where it coincides with Steele Street.

Table 4-6 presents the relative potential linear-foot impacts to wetlands, woodlands, and wildlife habitats of the alignment alternative as described in the preceding paragraphs.

RECREATION POTENTIAL

Many of the alternative roadway alignments investigated in this study pass by or through areas that have been planned for park or recreation improvements. The South Platte River Recreation and Wildlife Master Plan, an interagency regional study, designates several areas along the river for recreational development and wildlife enhancement. Adams County, the City of Thornton, and Commerce City also have land use plans indicating open space and recreational uses for many of the drainageway corridors. This subsection summarizes how the proposed roadway alignment alternatives may affect these proposed park facilities.

96th AVENUE CORRIDOR

In Segment 1 of this corridor, Alternative 1A passes through an existing gravel lake designated for improvement as a fishing and swimming lake at a point 3,000 feet east of Riverdale Road. Construction of this roadway would divide the lake into two water bodies, one significantly larger than the other. This change would probably not prevent those future recreation improvements. This alternative also passes over the proposed hike-bike trail at the river. The bridge design for this area should accommodate this trail.

In Segment 2 of this corridor, the combined roadway Alternatives 2B and 2C cross First Creek near Peoria Street. The

Table 4-6
IMPACTS TO WETLANDS, WOODLANDS, AND WILDLIFE HABITATS

<u>Corridor Segment and Alignment Alternatives</u>	<u>Wetlands</u>	<u>Riparian Woodlands</u>	<u>Seasonal Wetlands/ Canals</u>	<u>Cultural Woodlands</u>	<u>Totals</u>
Quebec St. to Vasquez Blvd.					
Segment No. 1					
A--B Alter. Combined	150 LF		400 LF		550 LF
Segment No. 2					
A--B Alter. Combined			100 LF	1,700 LF	1,800 LF
A Alternative	1,000 LF	700 LF			1,700 LF
B Alternative	300 LF	800LF			1,100 LF
Quebec/Quebec Corridor					
Segment No. 1					
A Alternative	400 LF	2,200 LF	200 LF		2,800 LF
B Alternative	1,000 LF	1,000 LF			1,500 LF
C Alternative	300 LF	600 LF		900LF	1,000 LF
Segment No. 2					
A Alternative			175 LF		175 LF
B Alternative			200 LF		600 LF
C Alternative			200 LF		1,000 LF
D Alternative			175 LF		100 LF
Segment No. 3					
B Alternative				4,000 LF	4,000 LF
Segment No. 4					
A--B Alternative				1800 LF	1,800 LF
96th Avenue					
Segment No. 1					
A--B Alternative			150 LF	400 LF	550 LF
A Alternative	250 LF	300 LF		800 LF	1,350 LF
B Alternative	350 LF				350 LF
Segment No. 2					
A--B Alternative			100 LF		100 LF
A Alternative				750 LF	750 LF
C Alternative			100 LF		100 LF
B--C Alternative	50 LF				50 LF
Colorado/York Corridor					
Segment No. 1					
C Alternative				300 LF	300 LF
A--B--C Alternative			50 LF		50 LF
Segment No. 2					
B Alternative				600 LF	600 LF

Adams County land use plan designates this area as flood plain and open space. More specific plans, however, are not available. The O'Brian Canal is also crossed by all alternatives, just west of the Burlington Northern Railroad. The Adams County plan includes this canal as part of a trail connection to Barr Lake.

QUEBEC STREET/VASQUEZ BOULEVARD CORRIDOR

In the City of Thornton Comprehensive Plan, a "Quebec Parkway" alignment is identified north of the project area. Although not specifically described, this is interpreted to designate a divided roadway with a median and adequate right-of-way for extensive tree and shrub planting. This consideration should be given to the recommended alignment during the preliminary and final design phases for the corridor.

Another Thornton open space element is in Segment 1, where combined Alternatives 1A and 1B cross an area described in the Thornton Comprehensive Plan as an open space corridor connection to the South Platte River. However, no specific plans for trails are available. Final roadway planning should consider this in more detail. Also, another similar corridor in Segment 1 exists at lower Grange Hall Creek just north of 104th Avenue.

In Segment 2, Alternatives 2A and 2B will pass along the edges of gravel lakes, 1500 feet south of 96th Avenue. These lakes are designated in the South Platte River Master Plan to be improved for fishing and swimming. Although the size of the lakes would be reduced with either of these roadway alternatives, the access potential would be enhanced. Regrading and landscaping of the lakes would also create a visual landscape amenity for the roadway. Design of a bridge over the river would also need to accommodate the proposed hike-bike trail paralleling the west shoreline.

Alternative 2B would also pass through a proposed wildlife enhancement area on the southeast side of the river, immediately south of the lakes previously mentioned. Special mitigation measures should be considered for this area.

QUEBEC STREET/QUEBEC STREET CORRIDOR

In Segment 1 of this corridor, Alternative 1A passes over a proposed hike-bike trail on the west side of the Platte River and within 150 feet of a proposed boat chute and landing near the Brantner Diversion Dam. This occurs approximately 2,500 feet north of 104th Avenue.

Alternative 1A also passes through an area designated for wildlife preservation and enhancement. Although this alternative may provide convenient vehicular access to the boat landing, it would require special attention in final design to minimize impact to wildlife areas and mitigate the affect of a roadway on a nearby park-like area.

In Segment 1, Alternative 1B also passes over the hike-bike trail and near another boat at the Fulton Diversion Dam. Again special considerations in roadway and bridge design will be necessary to accommodate these facilities in the appropriate fashion. Enhanced auto accessibility to this boat landing, if done sensitively, could provide an attractive recreation amenity.

COLORADO BOULEVARD/YORK STREET CORRIDOR

In Segment 1 of this corridor, Alternatives 1A, 1B, and 1C provide access to a proposed recreation area formed by the reclaimed mining lagoon south of the Riverdale Farms Subdivision. Alternative 1B would allow room for a parking facility adjacent to the recreation area. Alternate 1B also parallels the lagoon on the west side providing potential

for additional access points. Alternative 1A would provide less access than Alternative 1B to the site, but it may provide access to the proposed hike-bike path along the Platte River. Alternative 1C would provide limited access to the recreation area. No other recreation benefit would occur because the alignment follows Steele Street.

In Segment 2, only Alternative 2A may provide a recreational benefit by allowing access to the proposed hike-bike path along the Platte River.

IMPACTS TO MAJOR DRAINAGEWAYS

The impacts to major drainageways in the study corridors were addressed and are divided into those that occur to the South Platte River and its flood plain, and those that occur to the tributary drainageways in the project area. Impacts to irrigation ditches were also addressed and are included in this discussion.

SOUTH PLATTE RIVER IMPACTS

The feasible alternative alignments for the 96th Avenue, Quebec Street/Quebec Street, and Quebec Street/Vasquez Boulevard corridors cross the Platte River in seven different locations. To assess possible impacts, all of the alignments were superimposed on the 1977 Flood Hazard Area Delineation (FHAD) 100-year flood plain, and the proposed channel right-of-way from the 1985 South Platte River Phase B Volume I Master Plan (Master Plan).

Review of FHAD and Master Plan

The 100-year flood plain averages approximately 4,000 feet in width through the area under study with a proposed channel

right-of-way of 340 feet. The channel is planned to convey the 10-year event, and discharges exceeding the channel capacity will flood overbank areas to flood plain widths somewhat less than the 4,000-foot-wide existing flood plain. One-hundred-year flood depths will ultimately be lowered by as much as 2 feet in the study area. The Master Plan also calls for the regulation of the existing flood plains and states the following:

"The existing flood plains...from Sand Creek to Brighton should be permanently managed and regulated."

However, guidelines for flood plain management and regulation are not specific. Adams County flood plain regulations are currently undergoing a revision that will include the Urban Drainage and Flood Control Districts' (UD and FCD) flood plain regulation. The Master Plan has also outlined certain objectives that apply to this study:

- o One-Hundred-Year Design Flood. The 100-year design flood should be the basis for flood plain planning in the South Platte River corridor. The 1 percent criterion means that ramifications of the 100-year design flood must always be evaluated as to impact and land use optimization. It does not mean that overbank flooding during the 100-year design flood must be eliminated.
- o Transportation. Roads, highways, and bridges should not cause flood problems or increase flood-related damages. Transportation should not conflict with the recreational and park use of the corridor without mitigation measures. Bridge crossings of the South Platte River should not cause backwater effects and should have piers and abutments designed to resist erosion by the river.

- o Access Trail. Access to the river should be maintained for operational and maintenance purposes, and to afford ready inspection of problem areas. Such access trails shall, where practical, serve a multiuse function for hiking, running, biking, and nonmotorized transportation.
- o Continuous Linear Boating. Safety and enjoyment of the river should be provided for continuous boating through the Denver area. All dams and check dams should have safe boat chutes suitable for the typical boater for river flows up to 1,500 cubic feet per second (cfs).
- o Aquatic Life. Measures to protect and enhance fishing and aquatic life should be implemented where feasible.
- o Birds and Terrestrial Wildlife. Enhancement of the river environment suitable for birds and terrestrial wildlife should be achieved.
- o Regional Recreational Plans. South Platte River parks and recreation development plans, gravel mining operations and permits, and river corridor development should be fully coordinated with regional recreational plans of the various governmental entities, or groups of entities.
- o Flood Plain Management Program. The South Platte River corridor should have a viable flood plain management program throughout its entire 40-mile reach. Particular emphasis should be placed upon flood plain management between Sand Creek and Baseline Road (Brighton).

Design Discharges

Discharges presented in the Master Plan for the river reaches impacted by this study are shown on Table 4-7.

Table 4-7 SOUTH PLATTE RIVER FLOOD HYDROLOGY				
<u>Location</u>	<u>2-Year</u>	<u>10-Year</u>	<u>50-Year</u>	<u>100-Year</u>
D/S Clear Creek	3,550	13,000	28,600	38,000

Channel Design

The Master Plan presents the following criteria for channel design:

<u>Design Parameter</u>	<u>10-Year Event</u>
Bottom width	250 feet
Normal depth	8.1 feet
Channel depth	9 feet
Manning's n	0.035
Side slope of banks	4:1
Slope of river beds between drops	7 feet per mile

Proposed Improvements

Proposed physical improvements from the Master Plan for the reach of the river under analyses include the following:

- o Replacement of existing bridges at East 88th Avenue, Monaco Street (McKay Road), and East 104th Avenue

- o Channel bank protection with riprap or riprap with vegetation for the 10-year event
- o Lowering of the channel profile by up to 5 feet
- o Relocation of the Fulton Ditch and its diversion dam approximately 2,300 feet upstream and construction of a boat chute through the dam
- o Widening of the channel in locations where necessary to convey the 10-year event
- o The addition of armour crossings to stabilize the channel bed
- o Relocation of the Brantner Ditch and its diversion dam

CRITERIA DEVELOPMENT FOR ROADWAY ALIGNMENT ANALYSIS

Based on the above review of the Master Plan and FHAD, criteria have been developed for the roadway alignment analysis. In addition to the review, UD and FCD personnel and Master Plan authors have been consulted.

The actual design of the roadways and crossings within the flood plain is contingent on the implementation of proposed Master Plan improvements. The Master Plan implementation schedule appears to be contingent on a number of factors. Primary factors include the rate of development in the area and the subsequent dedication of channel right-of-way and installation of river stabilization measures, the construction of major structures that will help control channel grades, such as the relocated Fulton and Bratner Ditch

Diversions and the time it takes for the river to erode its bed and banks to desired Master Plan channel cross sections and profiles. Several Master Plan improvements are underway now, but the ultimate design for the entire reach may not be achieved for many years. Therefore, the criteria developed herein will fit proposed Master Plan improvements and existing Adams County regulations.

An example of this has to do with the bridge crossings. When Master Plan improvements are implemented, the main channel will convey the 10-year flow whereas it now generally conveys less than the 10-year flow. This will result in the overbank areas carrying less than they do now. Bridges are proposed on the main channel and in wide overbank areas. If the bridges in the overbank areas are designed before the Master Plan is implemented, they will need to be designed for the existing higher discharges to meet Adams County regulations. When the Master Plan is implemented, the bridges will be overdesigned. Adams County and UD and FCD could choose to design for future conditions, if the temporary impacts of underdesigned structures are acceptable.

CRITERIA

The Master Plan shows bridge cross sections with 450-foot-long spans that are sized for the assumption that the entire 100-year discharge of 38,000 cfs is within the channel or will pass through the bridge.

Passing the 38,000 cfs through one bridge may not be possible without increasing upstream water surface elevations more than recommended by the Master Plan or allowed by Adams County. The hydraulic losses generated by constructing a 4,000-foot-wide flood plain to a 450-foot-wide opening will

most likely be prohibitive. However, for the purpose of this study, the 100-year bridges have been included in the analysis. During the preliminary design of the crossings, it will be important to size the main channel bridges realistically.

The alternative alignments impact overbank areas more significantly than the main channel. The reason for this is the distribution of 100-year flood flows. Approximately one-third of the flows are in the channel and two-thirds are distributed in the overbank areas. The portion of overbank flows that can be funneled through the main channel bridges without exceeding Adams County flood plain regulations will vary for each alternative alignment. For the purposes of this study, it was assumed that a maximum of two-thirds of the entire 100-year discharge could be funneled through the main channel bridges and a minimum of one-third would be conveyed through overbank bridge structures for the alternative with the best crossing alignments. For the heavily skewed alternatives, less conveyance was estimated in the channel and more in the overbanks. Overbank bridge spans were sized by assuming depths of 3 feet and velocities of 5 feet per second. Spur dikes may be required at the overbank crossings and main channel crossings. Main channel crossings were all allocated 450-foot bridges per the Master Plan, regardless of the flow distribution.

When preliminary designs are undertaken for the recommended alignments, detailed hydraulic studies are recommended to determine roadway and bridge designs that will meet Adams County flood plain regulations. For the purpose of this study, the following assumptions were made:

- o The roadway would be above the 100-year flood elevation.

- o The roadway crossings would cause no more than negligible backwater effects.

CROSSING ANALYSIS

Quebec Street/Vasquez Boulevard (Segment 2)--Alternatives A and B

Alternatives A and B were assumed to have equivalent impacts on the river and flood plain. Both alignments will require 450-foot bridge spans in each overbank area. Table 4-8 shows assumed flow distributions and bridge lengths.

Quebec Street/Quebec Street (Segment 1)--Alternative A, Alternative B, and Alternative C

Alternative A significantly impacts the east flood plain and would essentially cut off flows east of the river and would probably cause an increased flood plain width and elevation west of the river. To mitigate possible backwater effects, 1,700 feet of bridge span was estimated for the east overbank in addition to the 450-foot main channel bridge.

Alternative B would encroach on a relatively small east flood plain and a very wide west flood plain. It is skewed so that it runs parallel to the river, and therefore, impacts an extensive area within the west flood plain. To convey the large assumed flow distribution in the west overbank, 1,200 feet of bridge length was estimated in addition to the 450-foot main channel bridge.

Alternative C falls under the same assumptions as the Alternatives for the Quebec Street/Vasquez Boulevard corridor.

Table 4-8
ASSUMED FLOW DISTRIBUTIONS AND BRIDGE SIZING SOUTH PLATTE RIVER BRIDGES

Alignment Corridor Segment	Proposed 100-Year Flow Distribution (cfs)			Proposed 100-Year Bridge Length (feet)		
	West Flood Plain	Channel	East Flood Plain	West Flood Plain	Channel	East Flood Plain
Quebec/Vasquez Segment 2						
Alignments A and B	6,500	25,000	6,500	450	450 ^a	450
Quebec/Quebec Segment 1						
Alignment A	--	13,000	25,000	--	450	1,700
Alignment B	18,000	20,000	--	1,200	450	--
Alignment C	6,500	25,000	6,500	450	450	450
96th Avenue Segment 1						
Alignments A and B	6,500	25,000	6,500	450	450	450

^a Increase to 600 feet due to angle of river crossing.

It will require one 450-foot bridge span on the main channel and 450-foot bridges for each overbank area.

96th Avenue--(Segment 1)

Alternatives A and B

These alternatives fall under the same assumptions as the Quebec Street/Vasquez Boulevard alignments. Three 450-foot bridge spans are therefore recommended.

The above analysis represents conceptual level estimates of bridge lengths to be used for cost comparisons. The roadway embankments will significantly affect flood plain hydraulics, and in preliminary and final design phases, a detailed backwater analysis will be required to accurately determine the actual impacts. However, from an inspection of the alternative alignments and estimates of flow distributions based on flood plain width, the alternative alignments are ranked from best to worst (1 being best) for overall flood plain impact (Table 4-9):

Table 4-9
FLOOD PLAIN IMPACT RANKING

<u>Corridor</u>	<u>Alignment</u>	<u>Ranking</u>
Quebec Street/Vasquez Boulevard	2A	1
	2B	2
Quebec Street/Quebec Street	1C	1
	1B	2
	1A	3
96th Avenue	1A	1
	1B	2
Colorado Boulevard/York Street	1B and 1C	1
	1A	2

TRIBUTARY IMPACTS

Six major tributary drainageways have been identified that cross the alternative roadway alignments. The drainageways are listed in Table 4-10 with the alignments they cross, 100-year discharges and estimated bridge or box culvert openings. The 100-year discharges, alignments, and bridge or box culvert heights were obtained from the appropriate master plans. The headwater to depth ratios were calculated assuming the same headwater depths as channel depths taken from the Master Plan channel improvements for 100-year water surface elevations and 100-year discharges. Therefore, backwater effects from the proposed crossing will be negligible.

Table 4-10
TRIBUTARY DRAINAGEWAY CROSSINGS

Drainageway	Corridor	Alignment Segment	100-year Discharge Alternative	Estimated (cfs)	Crossing Size
DFA 0054	Quebec/Vasquez	1	A and B	1,820	7.5 ft H, 40 ft W
Lower Grange Hall Creek	Quebec/Vasquez	1	A and B	2,200	6.0 ft H, 70 ft W
	Quebec/Quebec	1	B	2,200	6.0 ft H, 70 ft W
DFA 0056	Quebec/Vasquez	1	A and B	--	54-inch dia. RCP
	Quebec/Quebec	1	C	--	42-inch dia. RCP
	Quebec/Vasquez	2	A and B	--	60-inch dia. RCP
	96th Avenue	1	A	--	60-inch dia. RCP
Niver Creek	Colorado Boulevard/ York Street	1	A and B	2,675	7 ft H, 70 ft W
DFA 0058	Quebec/Vasquez	2	A	145	6 ft H, 5 ft W
	Quebec/Quebec	1	C	750	7 ft H, 20 ft W
	96th Avenue	1	A and B	750	7 ft H, 20 ft W
First Creek	96th Avenue	2	B and C	7,400	8 ft H, 90 ft W

IRRIGATION DITCH IMPACTS

Several irrigation ditch crossings would be required under the alternative alignments. Table 4-11 shows the ditch

Table 4-11
IRRIGATION DITCH CROSSINGS

<u>Irrigation Ditch</u>	<u>Corridor</u>	<u>Segment</u>	<u>Alignment</u>	<u>Crossing Size</u>
			<u>Alternative</u>	
Burlington Ditch	Quebec/Quebec 96th Avenue	2	A, B, C & D	6 ft H x 40 ft W
		2	A, B, & C	6 ft H x 40 ft W
O'Brian Canal	Quebec/Quebec 96th Avenue	2	A, B, C & D	6 ft H x 60 ft W
		2	A, B, & C	6 ft H x 60 ft W
Fulton Ditch	Quebec/Quebec	1	A & B	6 ft H x 30 ft W
Colorado Agricultural Canal	96th Avenue	1	A & B	60-inch dia. RCP
	Quebec/Vasquez	1	A & B	60-inch dia. RCP
Lower Clear Creek Canal	96th Avenue	1	A & B	60-inch dia. RCP
	Quebec/Vasquez	1	A & B	60-inch dia. RCP

crossings and the proposed bridge or culvert size. The crossing sizes were estimated using master plan documents. The previous discussion outlines the impacts to major drainageways of the feasible alignment alternatives in the study corridors. During preliminary and final design along any of the roadway segments, close coordination should be maintained with the Urban Drainage and Flood Control District. This is particularly true for the South Platte River where the South Platte River Master Plan will be implemented.

UTILITIES

As part of this study, data were gathered concerning the locations of existing and planned utilities in the study area. These utilities included gas, electric, telephone, sanitary sewer, storm sewer, and storm drainage culverts. The major utility lines (electric lines of 100 kilovolt or

greater; gas lines 16 inches or larger; and sewers, storm sewers, and culverts larger than 36 inches) are shown on the alternative alignment figures in this section and on the recommended alignment figures in Section 5.

At the conceptual level of detail of this study, no major utility relocations were identified in conjunction with the alternative alignments except that relocation of one overhead electric tower will be required for the construction of alignment 1A on 96th Avenue. During preliminary and final design phases, data gathering and coordination should take place with utility companies in the study corridors to identify utility conflicts associated with the recommended alignments.

Section 5
Recommended Alignments

Section 5
RECOMMENDED ALIGNMENTS

INTRODUCTION

As a result of the evaluation process described in the previous section, the recommended alignment for each corridor was determined as the alternative with a number 1 ranking. The recommended alignments for the four study corridors are as follows:

<u>Corridor</u>	<u>Recommended Alignment</u>
96th Avenue	1A-2C
Quebec Street/Vasquez Boulevard	1A-2A
Quebec Street/Quebec Street	1A-2A-
	3A Modified-
	4A Modified
Colorado Boulevard/York Street	1B-2B

The following discussion highlights the recommended alignments and the key factors that influenced their selection.

96TH AVENUE

The recommended alignment for 96th Avenue, 1A-2C, begins at Colorado Boulevard along the existing 96th Avenue alignment. It crosses the South Platte River and the south end of a lake formed by the Cooley Gravel Company operations. It avoids the high impacts to the Cooley operation that would be caused by Alternative 1B, which deviates south of 96th Avenue and passes through the Cooley operation. The recommended

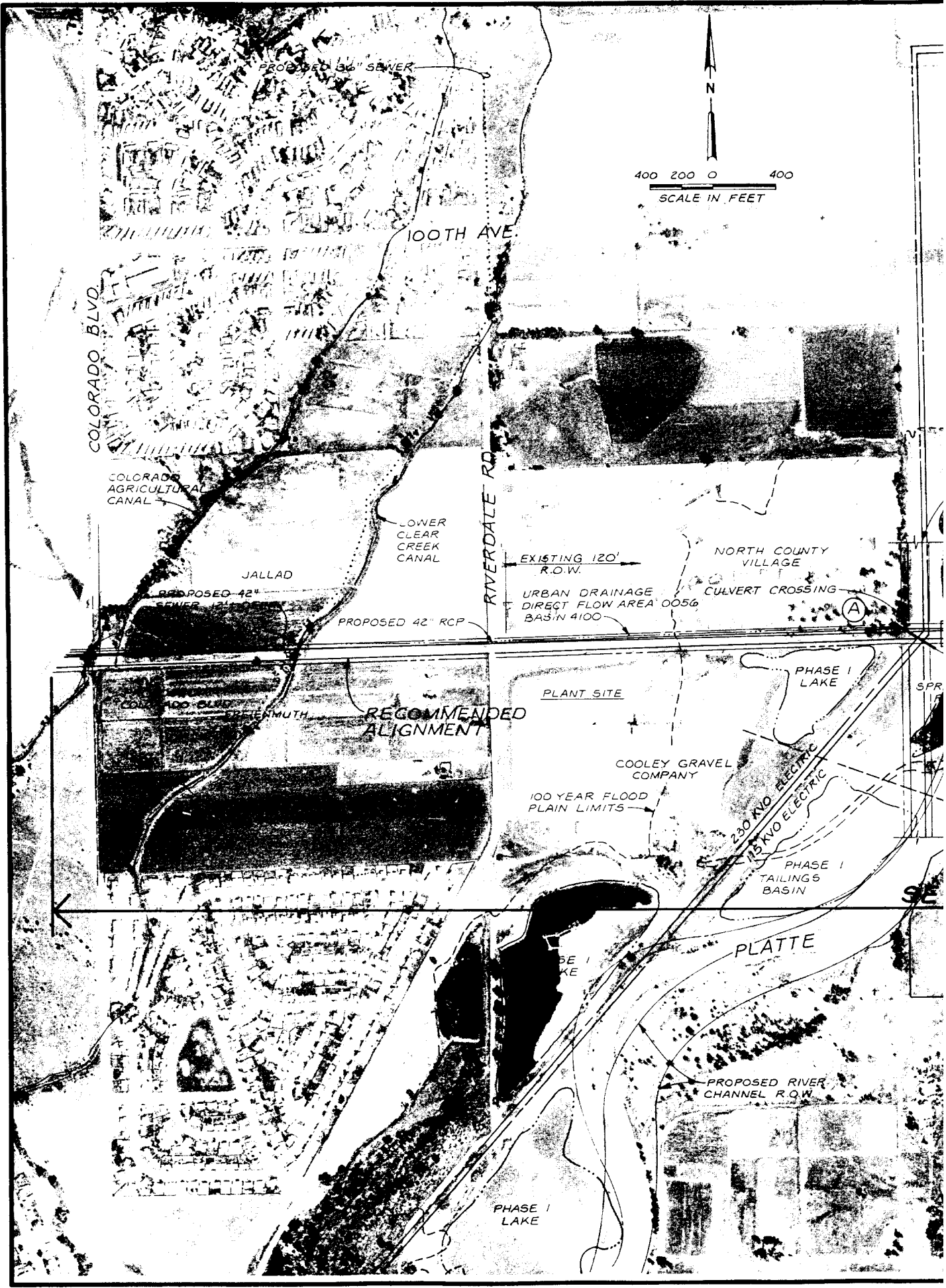
alignment then passes through the existing 96th Avenue underpass at I-76 and continues east along the existing 96th Avenue alignment to a point west of the Burlington Ditch where it curves to the north then back to the east to run parallel and approximately 1,200 feet to the north of 96th Avenue.

This alignment allows for development on both sides of 96th Avenue east of SH 2. It also has better roadway geometrics than Alternative 2B, and it leaves less odd-shaped, hard-to-develop parcels than Alternative 2B. The recommended alignment ends at Peoria Street, the eastern boundary of the 96th Avenue corridor. Figures 5-1 through 5-3 show the recommended alignment for 96th Avenue.

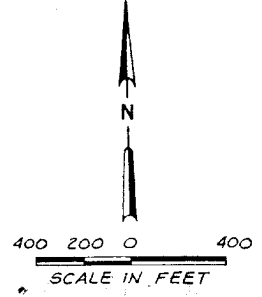
QUEBEC STREET/VASQUEZ BOULEVARD

The recommended alignment for Quebec Street/Vasquez Boulevard, 1A-2A, begins at 120th Avenue and Quebec Street and runs due south to just south of 112th Avenue. It then runs diagonally to the southwest to just north of 104th Avenue where it turns south and intersects 96th Avenue, crosses a small portion of the Cooley Gravel Company's lake and tailings basin and the South Platte River. It angles slightly to the southwest then runs due south to form the north leg of the Vasquez Boulevard interchange with I-76.

In the northern segment, this alignment is recommended over Alignment 1B because it bisects fewer properties, it is further from Riverdale Road, which may be desirable from a transportation network standpoint, and it forms a 90-degree intersection with the future 112th Avenue. In the southern segment, this alignment was chosen over Alignment 2B because it is straighter and it minimizes the impacts and constraints of the Cooley Gravel Company's mining operation south of 96th Avenue. Specifically, Alignment 2B passes through the



PROPOSED 36" SEWER



100TH AVE.

COLORADO BLVD.

COLORADO AGRICULTURAL CANAL

LOWER CLEAR CREEK CANAL

JALLAD

PROPOSED 42" SEWER

PROPOSED 42" RCP

EXISTING 120' R.O.W.
URBAN DRAINAGE DIRECT FLOW AREA 0056
BASIN 4100

NORTH COUNTY VILLAGE
CULVERT CROSSING

(A)

RECOMMENDED ALIGNMENT

PLANT SITE

COOLEY GRAVEL COMPANY

100 YEAR FLOOD PLAIN LIMITS

PHASE I LAKE

230 KVO ELECTRIC
15 KVO ELECTRIC

PHASE I TAILINGS BASIN

PLATTE

PROPOSED RIVER CHANNEL R.O.W.

PHASE I LAKE

SUBSTATION

230 KVO ELECTRIC

115 KVO ELECTRIC

PROPOSED CHANNED R.O.

PHASE 2 LAKE (FUTURE)

PHASE 2 LAKE (FUTURE)

WILDLIFE HABITAT AREA

PROPOSED HIKE, BIKE AND MAINTENANCE TRAIL WITH ADJACENT HORSE PATH, TYP

OKAY RD.

SOUTH ADAMS COUNTY WATER AND SANITATION DISTRICT WASTEWATER TREATMENT PLANT

100 YEAR FLOOD PLAIN LIMITS

GRABRMN

SPRAT-PLATTE RANCH

UNITED BANK OF BRIGHTON

LOVATO SINGLE EAGLE CO

96TH AVE

BRIDGE CROSSINGS

R+O SUBDIVISION R+O PARTNERSHIP

WILSON TRAILER COMPANY

COOLEY GRAVEL COMPANY MINING OPERATIONS

FUTURE DEVELOPMENT AREA

BRIDGE OR BOX CULVERT CROSSING

GRAVEL CONVEYOR

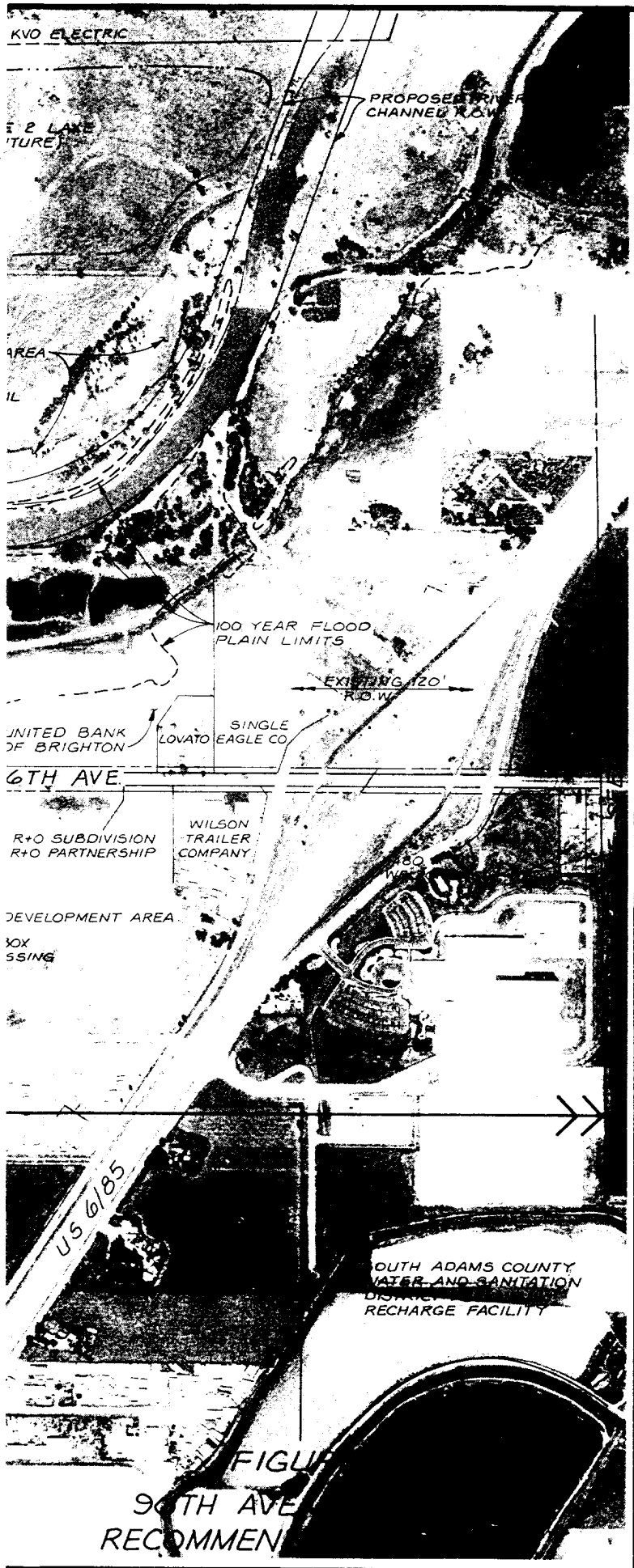
SEGMENT 1

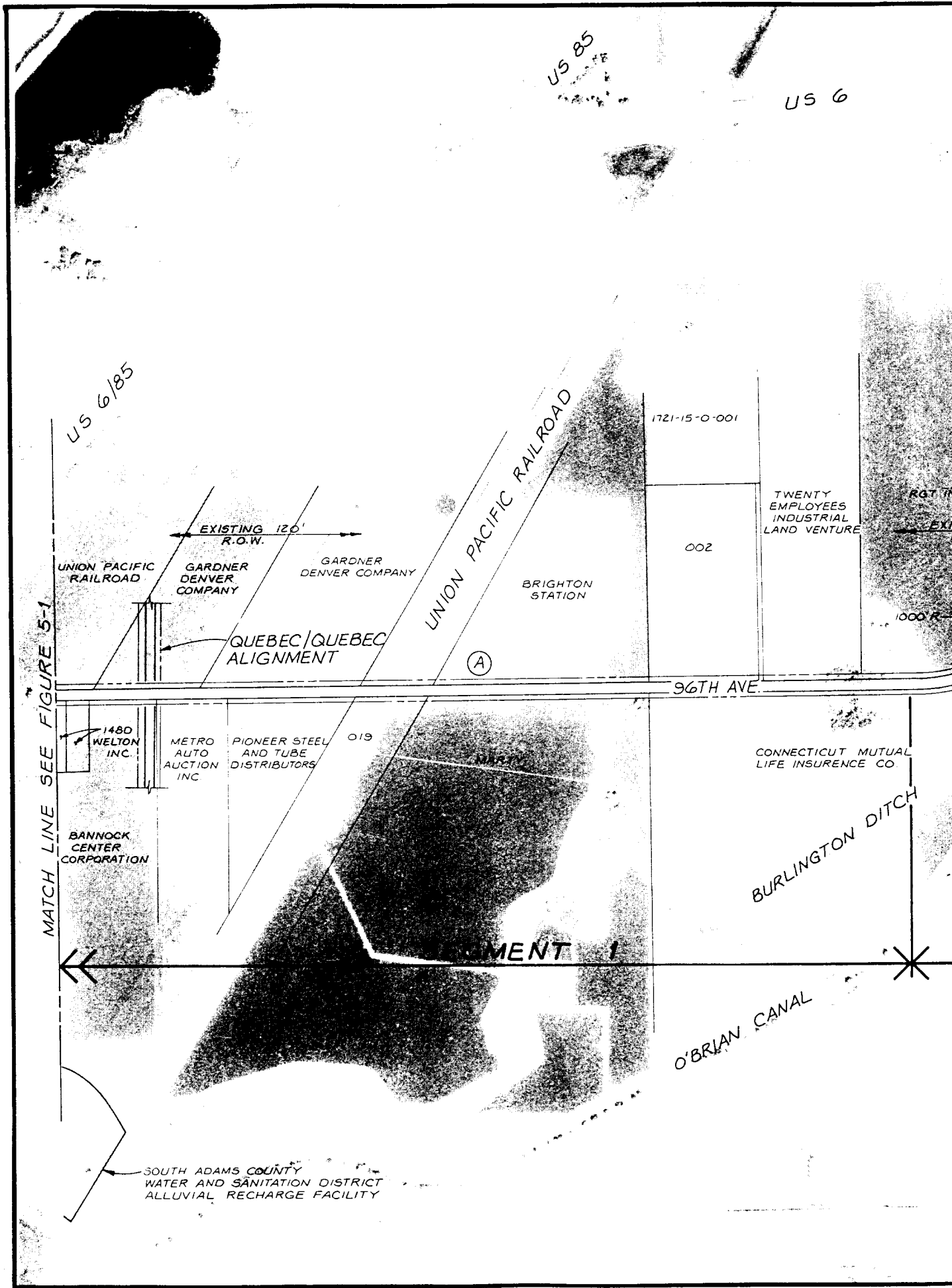
D.F.A. 0058, BULL SEEP

US 6185

SOUTH ADAMS COUNTY WATER AND SANITATION DISTRICT RECHARGE

FIGURE 96TH AVE RECOMMENDATION





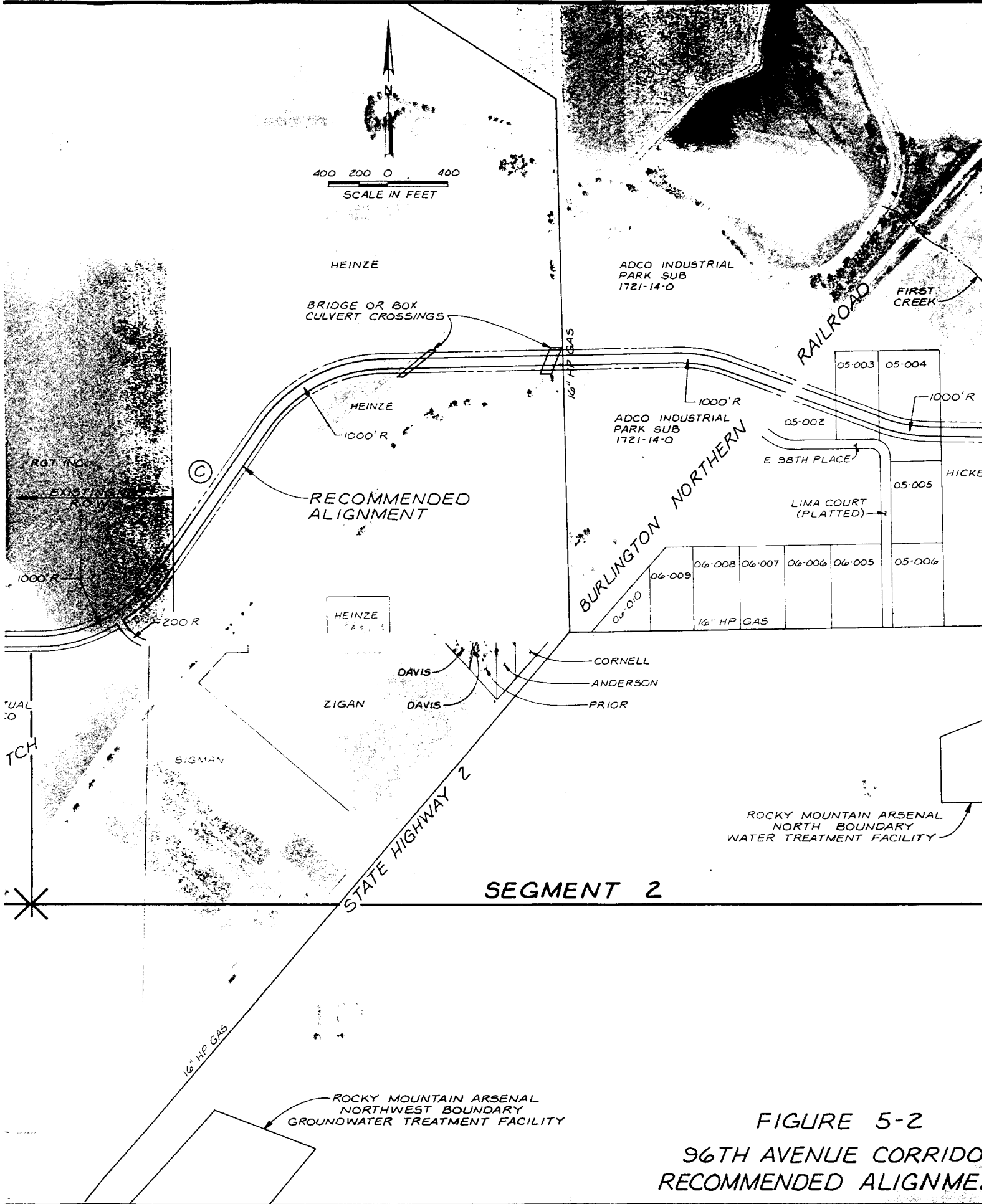


FIGURE 5-2
96TH AVENUE CORRIDOR
RECOMMENDED ALIGNMENT

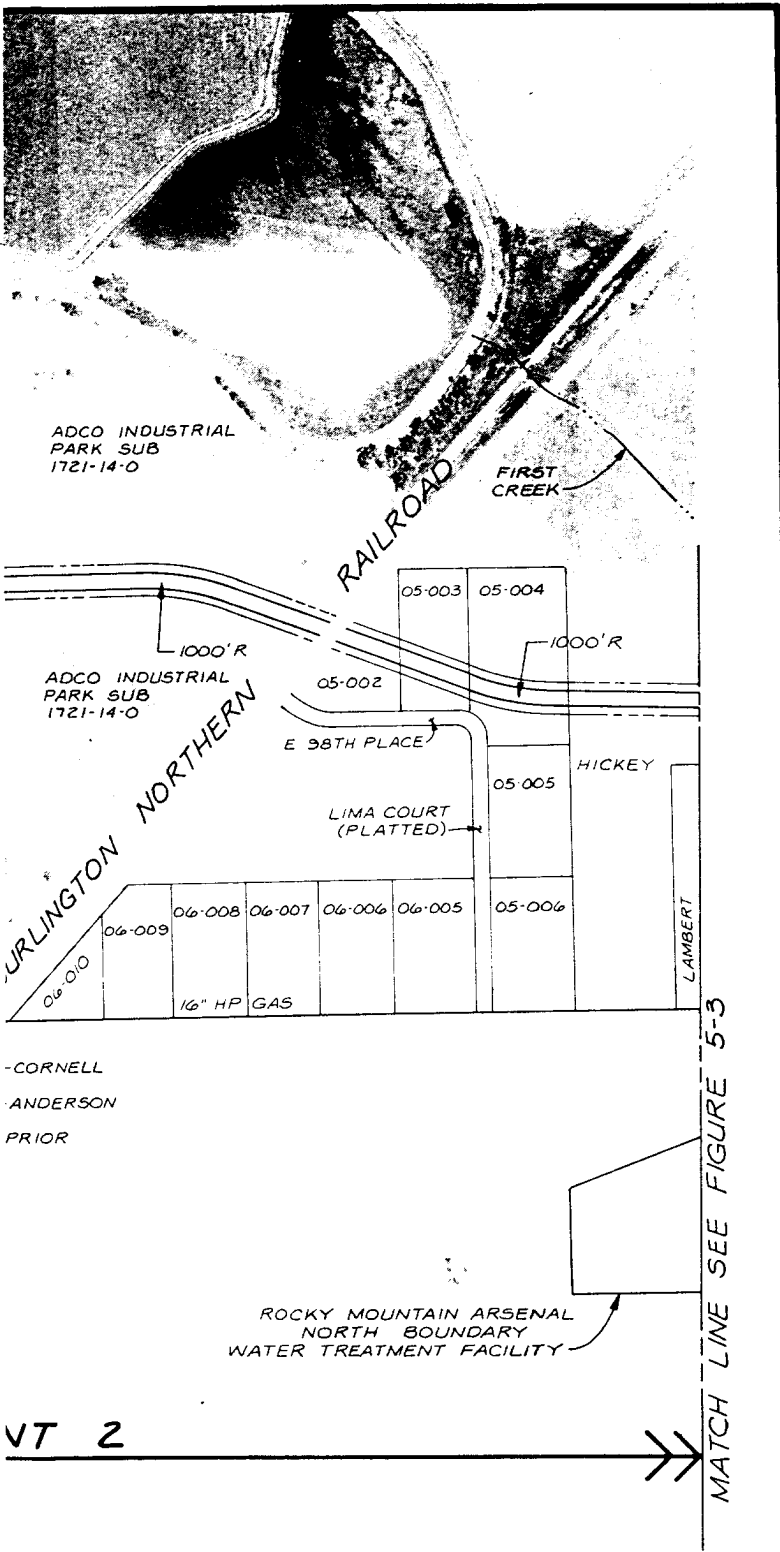


FIGURE 5-2
96TH AVENUE CORRIDOR
RECOMMENDED ALIGNMENT

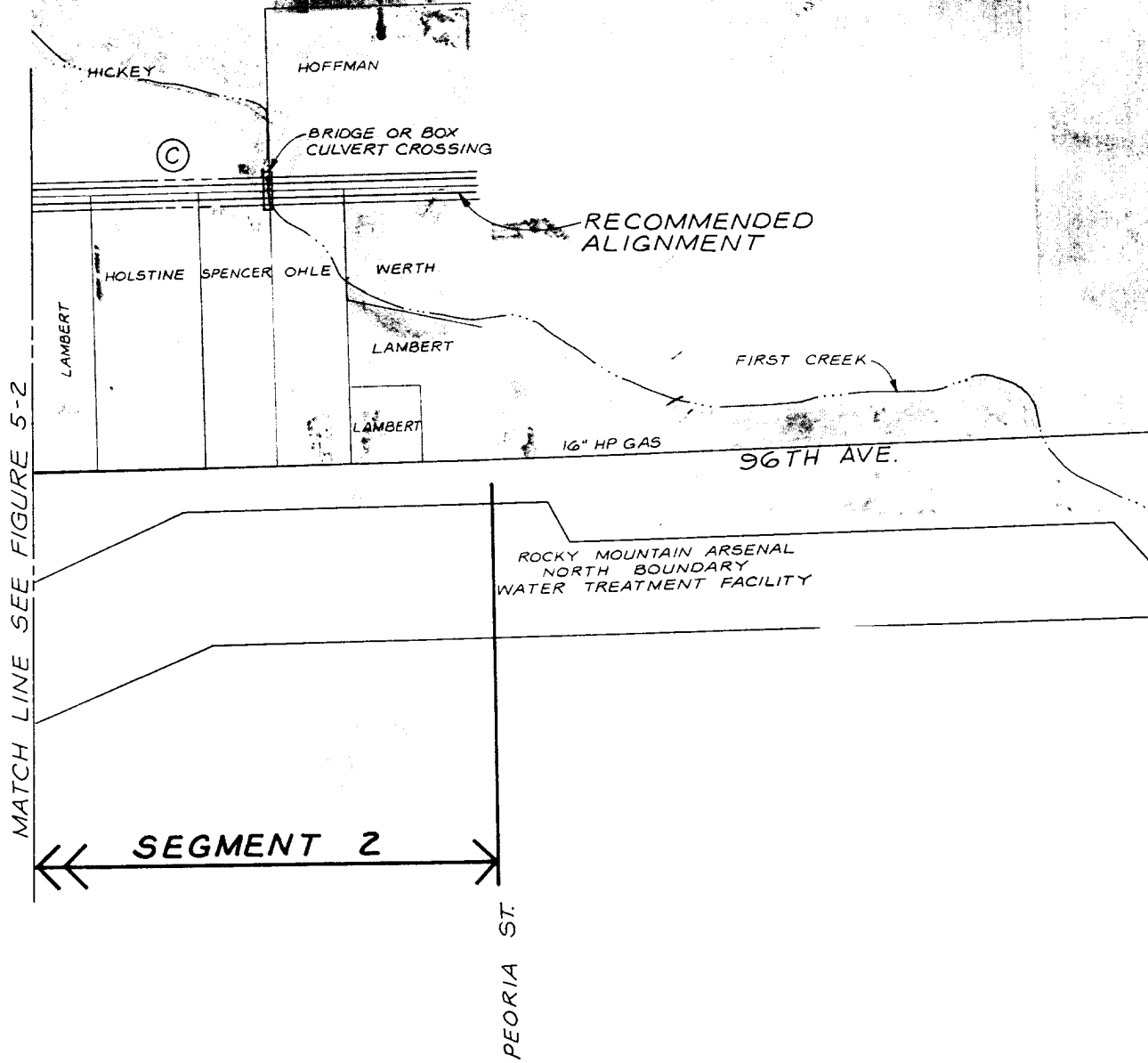
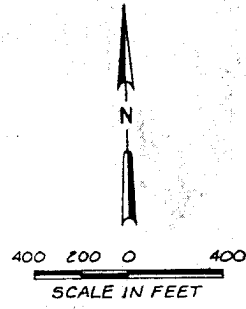


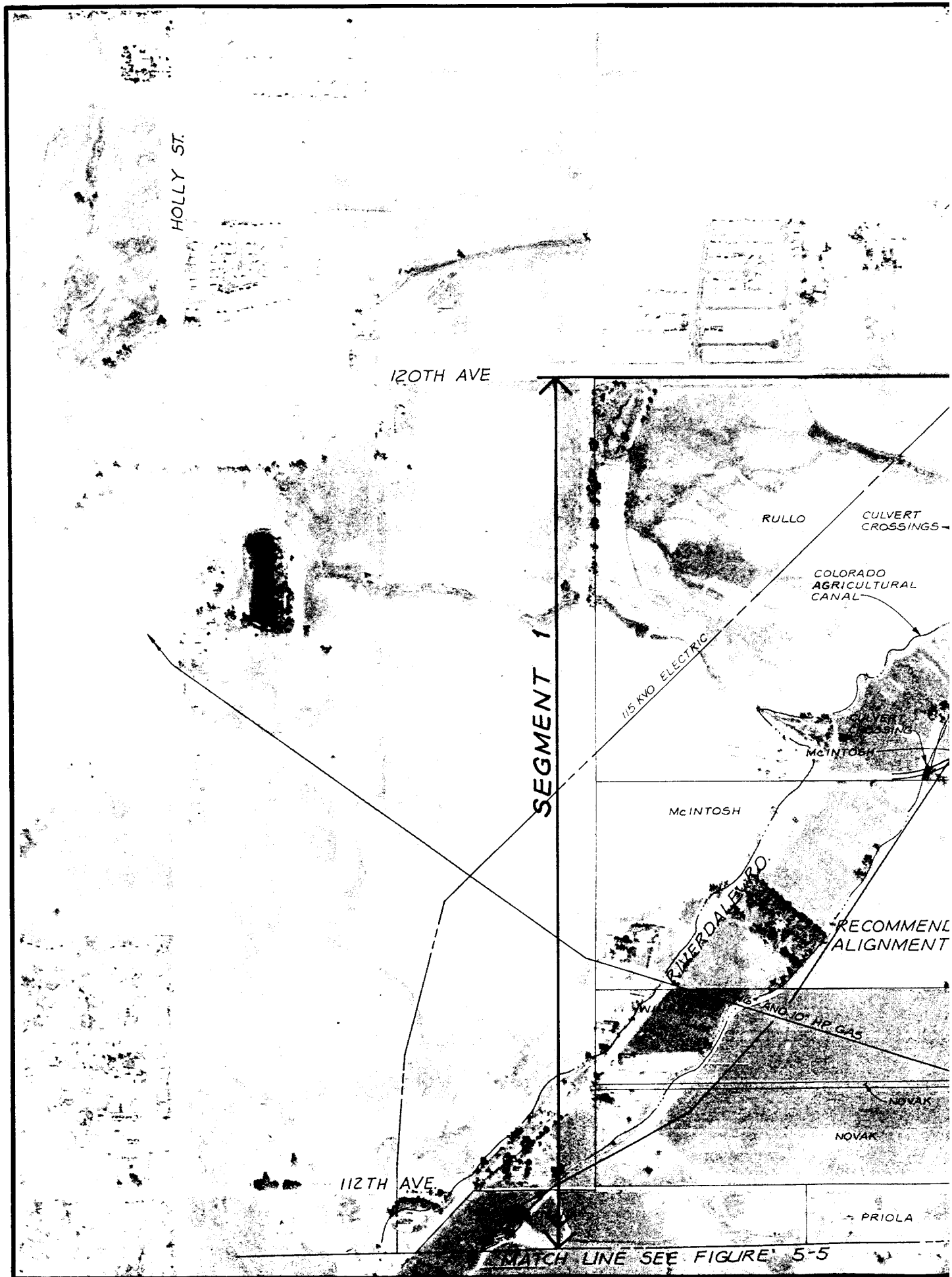
FIGURE 5-3
96TH AVENUE CORRIDOR
RECOMMENDED ALIGNMENT

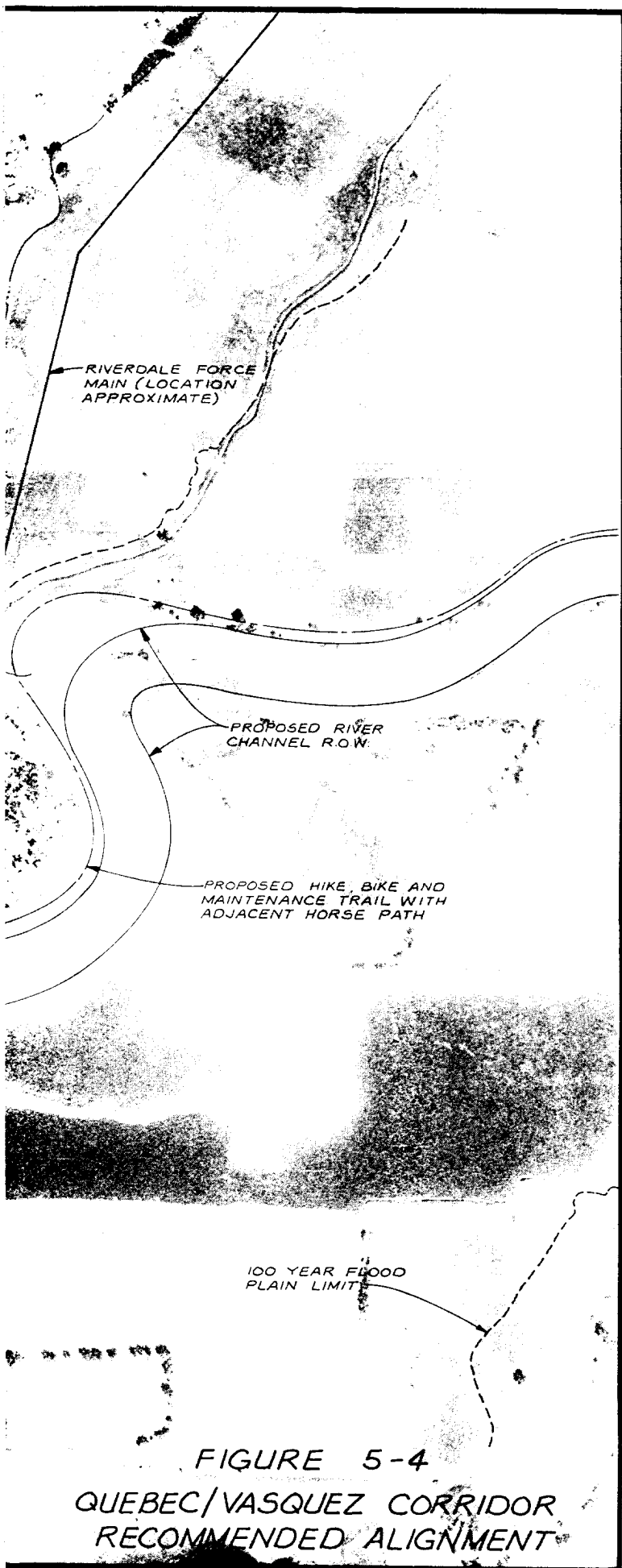
middle of the Cooley tailings basin. The tailings material would be very undesirable material on which to construct a roadway and would require costly removal and/or soil treatment. Figures 5-4 through 5-7 show the recommended alignment for the Quebec Street/Vasquez Boulevard connection.

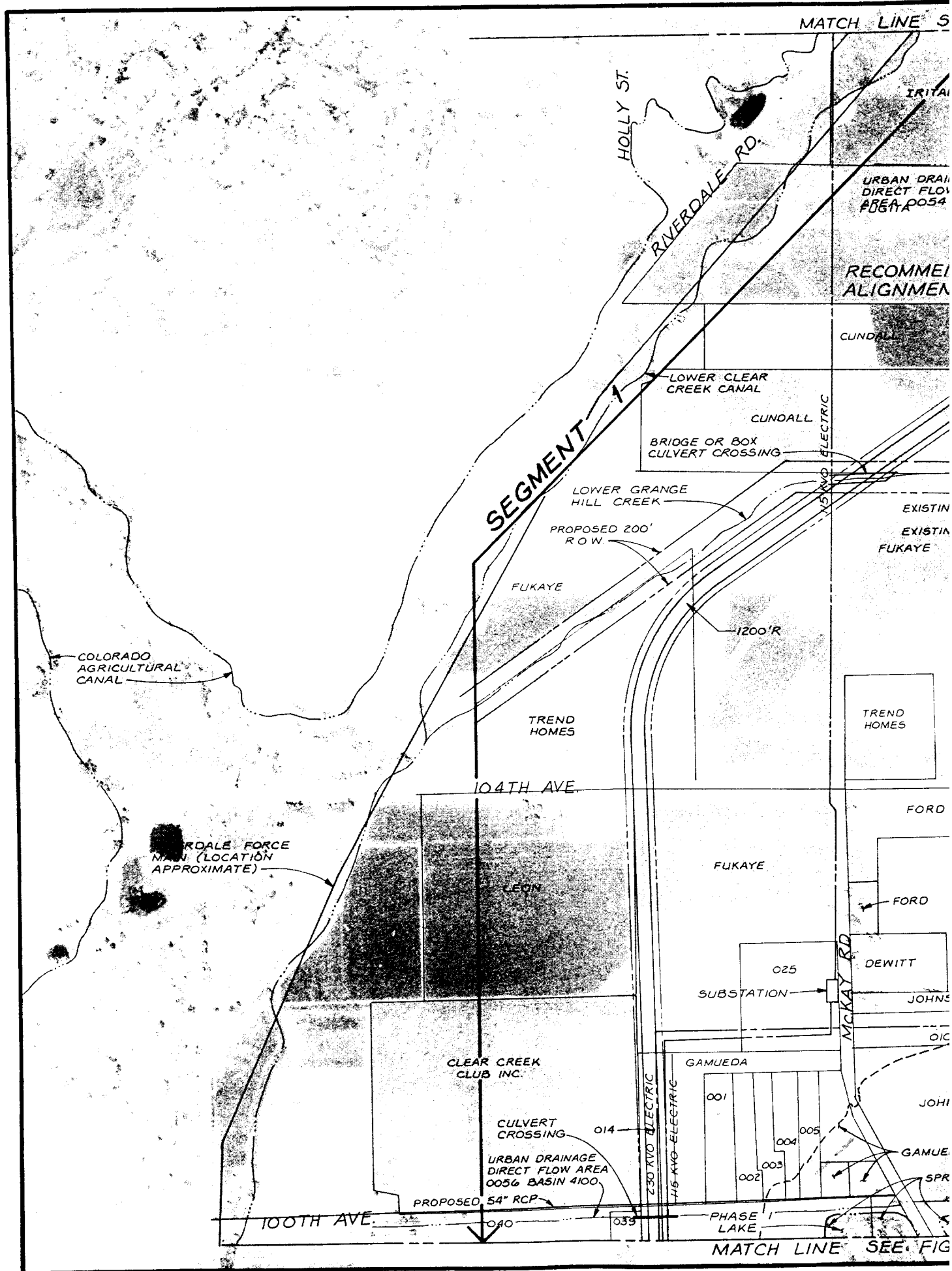
QUEBEC STREET/QUEBEC STREET

The recommended alignment for the Quebec Street/Quebec Street corridor is alignment 1A-2A-3A Modified-4A Modified. This alignment begins approximately 4,000 feet north of 104th Avenue, where it intersects the recommended alignment, 1A-2A of the Quebec Street/Vasquez Boulevard corridor. The alignment crosses the Platte River and then crosses I-76 approximately 2,400 feet north of the 96th Avenue interchange. It continues due south and crosses the Union Pacific Railroad tracks, and then runs parallel and 1,000 feet to the east of Rosemary Street. It then crosses SH 2 where it angles slightly to the southeast to the eastern boundary of the Irondale Groundwater Treatment Facility. The alignment then turns to the southwest to pass near the southeast corner of the future South Adams County Water and Sanitation District's water treatment plant site before it curves to the south to continue running through the Rocky Mountain Arsenal property, approximately 600 feet east of existing Quebec Street. It curves again to the west to join existing Quebec Street at approximately 62nd Avenue. The alignment then coincides with existing Quebec Street to 56th Avenue.

Alignment 1A-2A-3A Modified-4A Modified is the recommended alignment for the Quebec Street/Quebec Street corridor for a number of reasons. In Segment 1 on the north, 1A is recommended because it crosses the Platte River and runs on the







SEE FIGURE 5-4

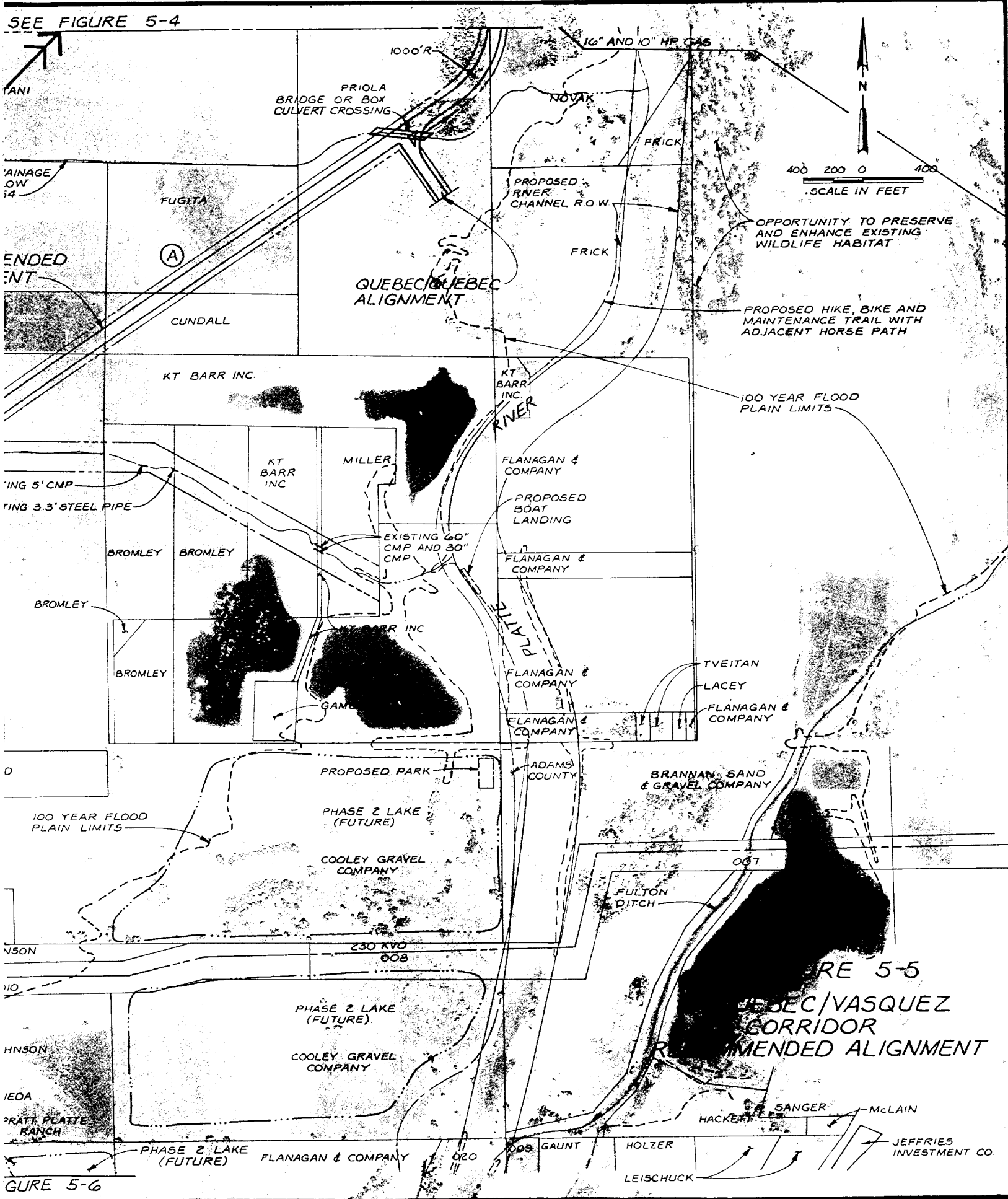
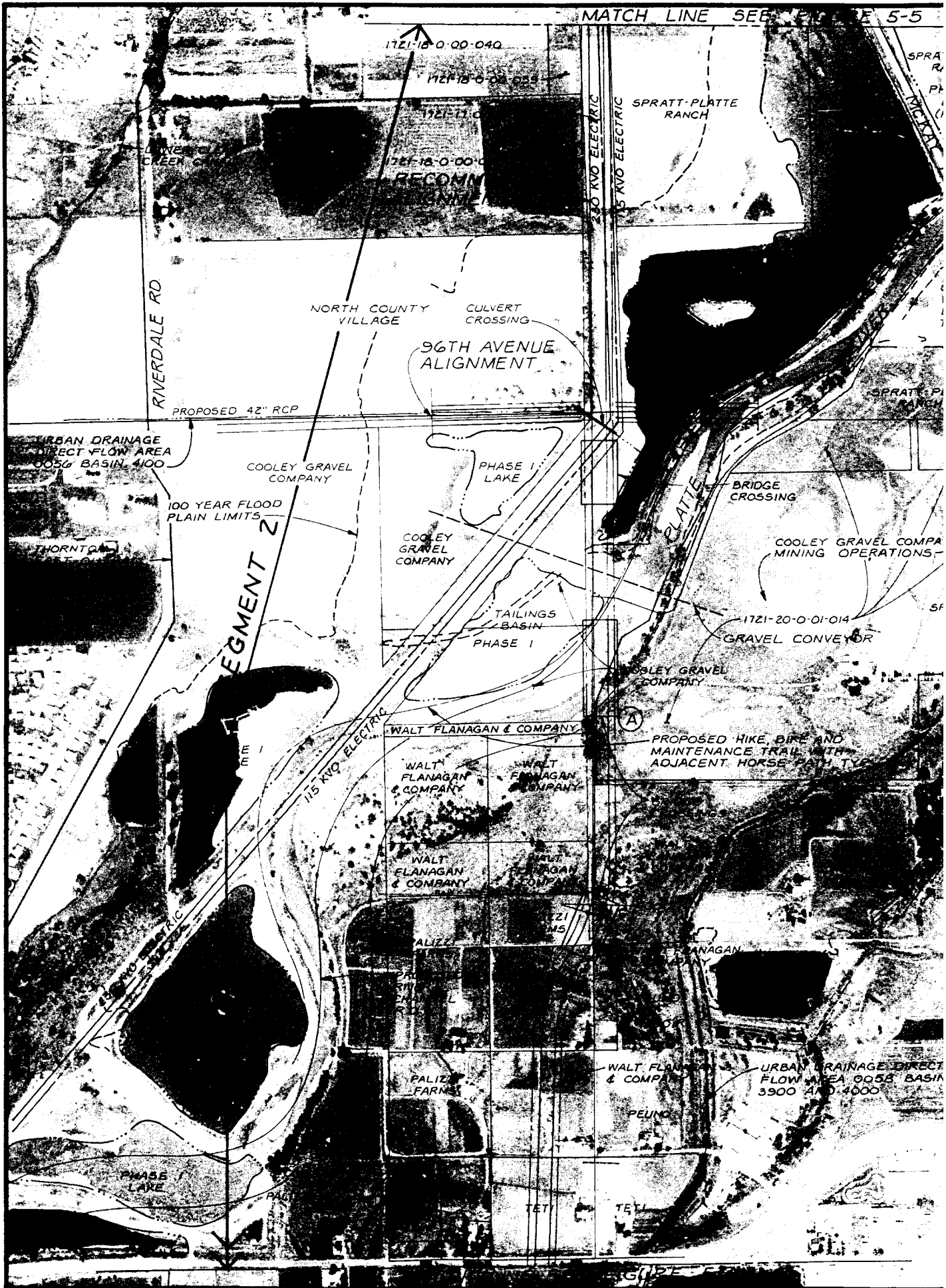
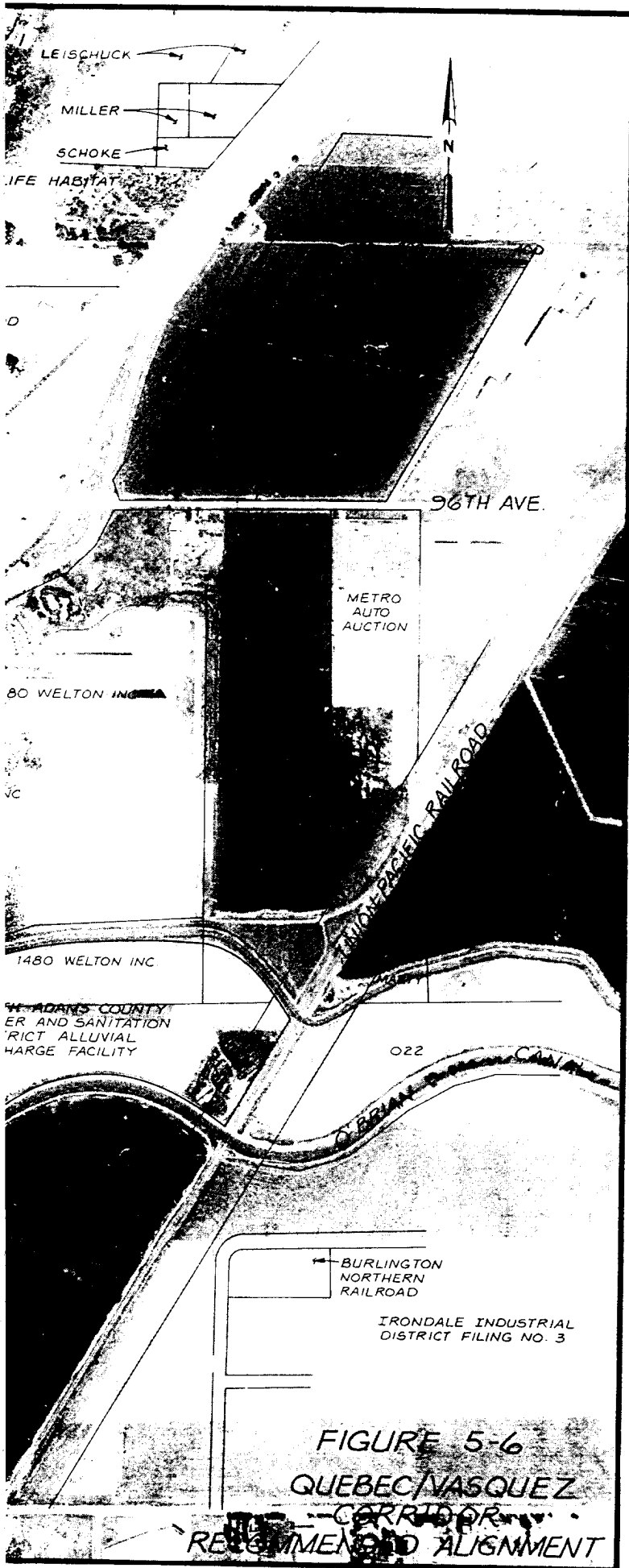
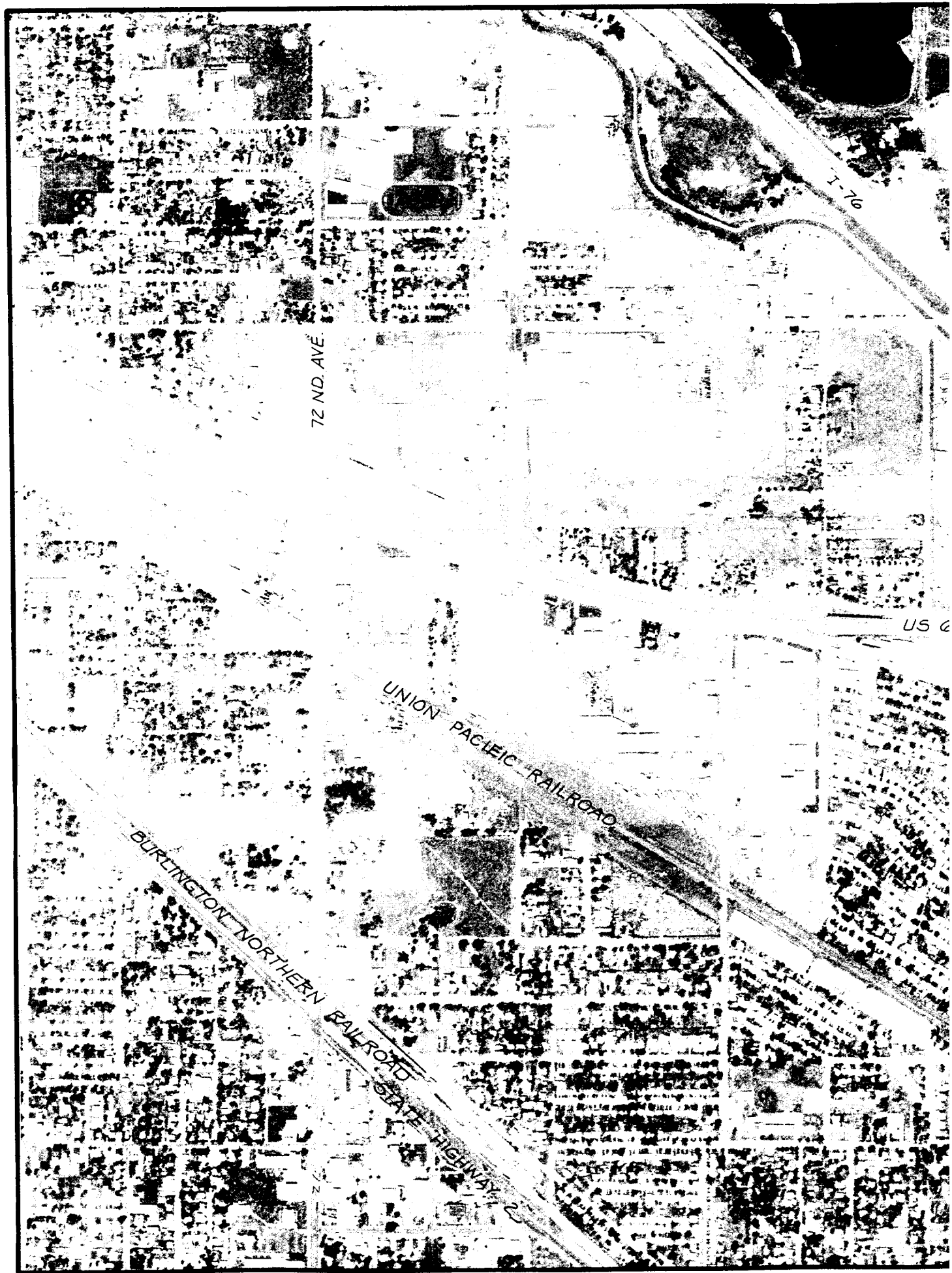
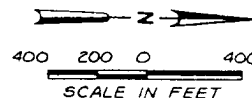


FIGURE 5-5
QUEBEC/VASQUEZ
CORRIDOR
RECOMMENDED ALIGNMENT









DAHLIA STREET

ENT 2

US 6/85

BRIDGE STRUCTURES

BRODA

BLOOD

BRODA

KINNEY

FLANAGAN

FLANAGAN

BRIDGE OR BOX
CULVERT
CROSSING

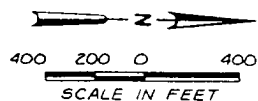
FREIGHT

(A)

URBAN DRAINAGE
DIRECT PLUS
0058

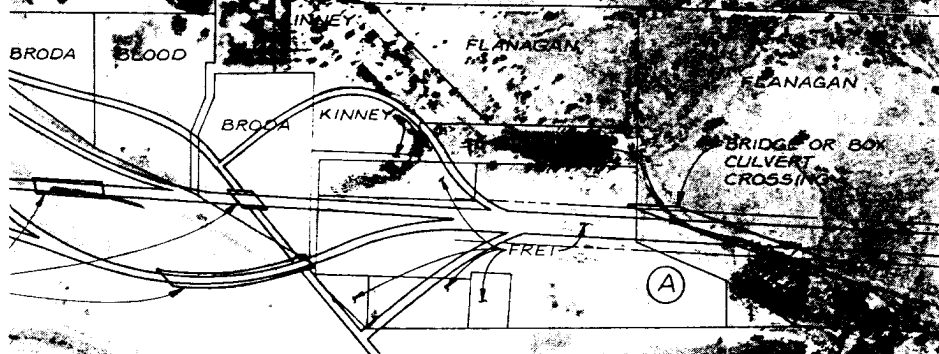
FIGURE 6-1

QUEBEC-VASQUEZ CORRIDOR
ALTERNATIVE ALIGNMENTS



DAHLIA STREET

MENT 2



URBAN OR
DIRECT
CROSSING

MATCH LINE - SEE FIGURE 5-8

FIGURE 6-1
QUEBEC-VANUETZ CORRIDOR
ALTERNATIVE ALIGNMENTS

east side of the river with relatively few impacts to residential or commercial properties unlike Alignments 1B and 2C. Alignment 1B, on the other hand, crosses Cooley Gravel Company property, which has been permitted for future gravel mining operations including the formation of lakes. Alignment 1C uses existing McKay Road through the South Adams County Water and Sanitation District Wastewater Treatment Plant. Because of the proximity of the plant's facilities and piping, it would be costly and likely prohibitive to widen the road to the required 155-foot right-of-way in this area. Also, Alignments 1B and 1C cross a large landfill area where it would be expensive to bring the subgrade to roadway standards.

In Segment 2, Alignment 2A is recommended because it continues due south with straight geometry whereas Alignments 2B, 2C, and 2D are more curvilinear. Alignments 2B and 2C also cross the South Adams County Alluvial Recharge Facility. In Segment 3, Alignment 3A Modified is recommended because it continues due south and avoids the many impacts to existing residential and commercial properties of Alignment 3B along Rosemary Street. It also avoids the potential impacts and concerns of the original alignment 3A by going to the east of the Irondale Groundwater Treatment Facility on the Rocky Mountain Arsenal property.

In Segment 4, Alignment 4A Modified is recommended because it ties in with Alignment 3A Modified, and it avoids the residential impacts and access locations along existing Quebec Street north of 62nd Avenue. South of 62nd Avenue, Alignment 4A Modified coincides with existing Quebec Street where the area is zoned for commercial land use. In this portion of the alignment, access points should be consolidated where possible. This will be especially important since CDOH plans to add Quebec Street to its roadway system

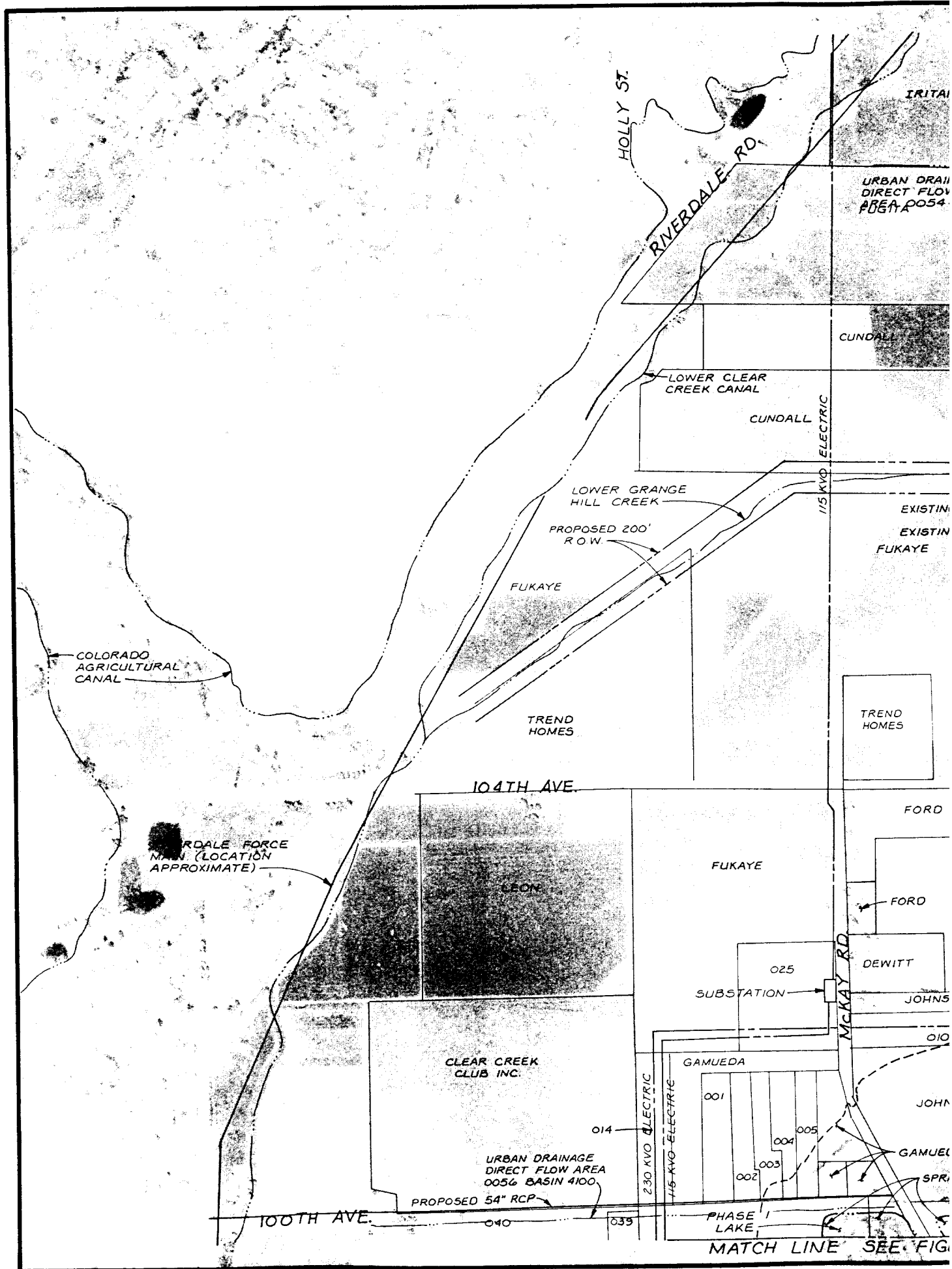
as a principal arterial street. The access points would then have to be accepted by CDOH.

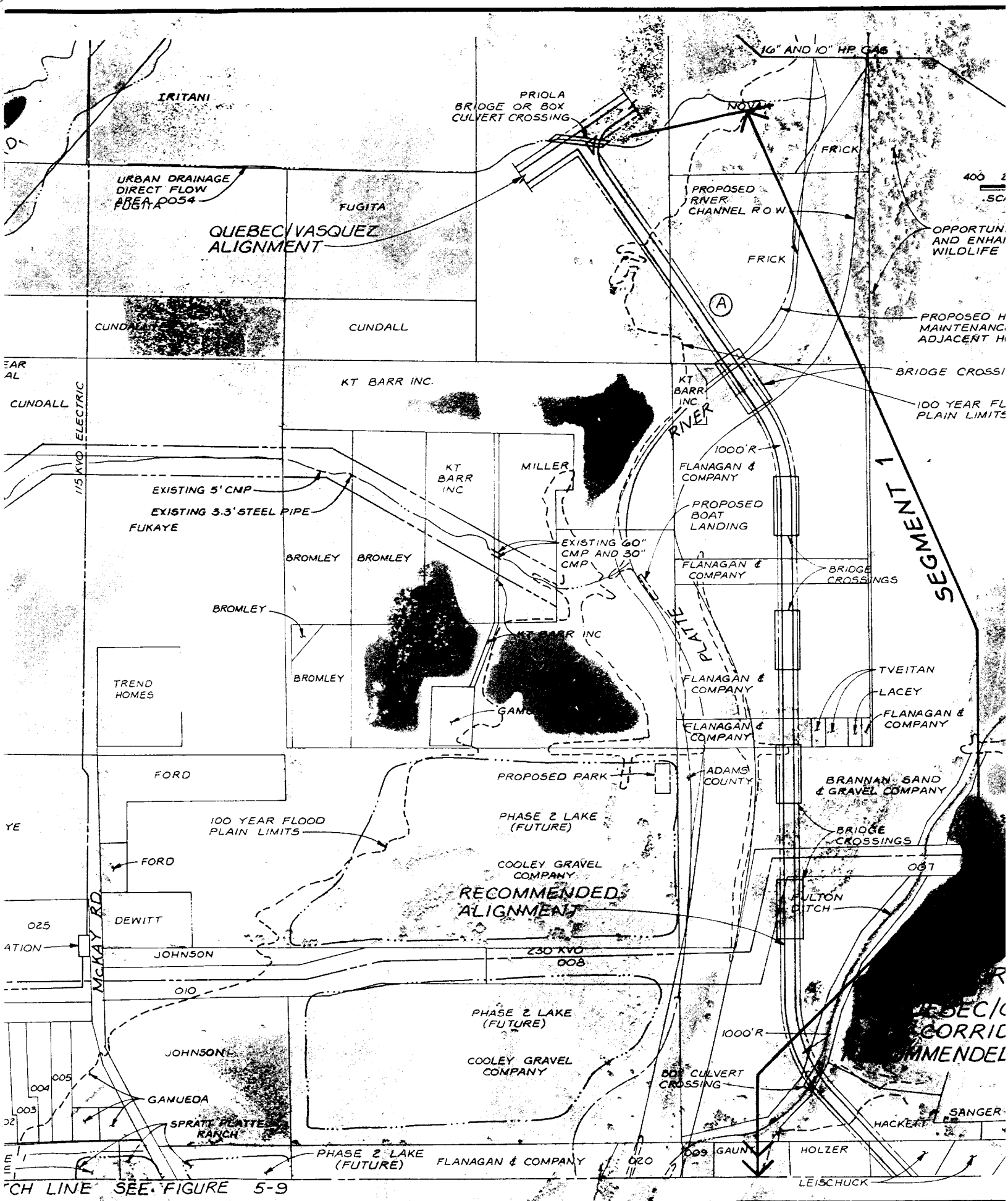
With Alignment 4A Modified, existing Quebec Street could remain as a collector street north of 62nd Avenue to provide access to adjacent properties. Figures 5-8 through 5-11 show the recommended alignment for the Quebec Street/Quebec Street connection.

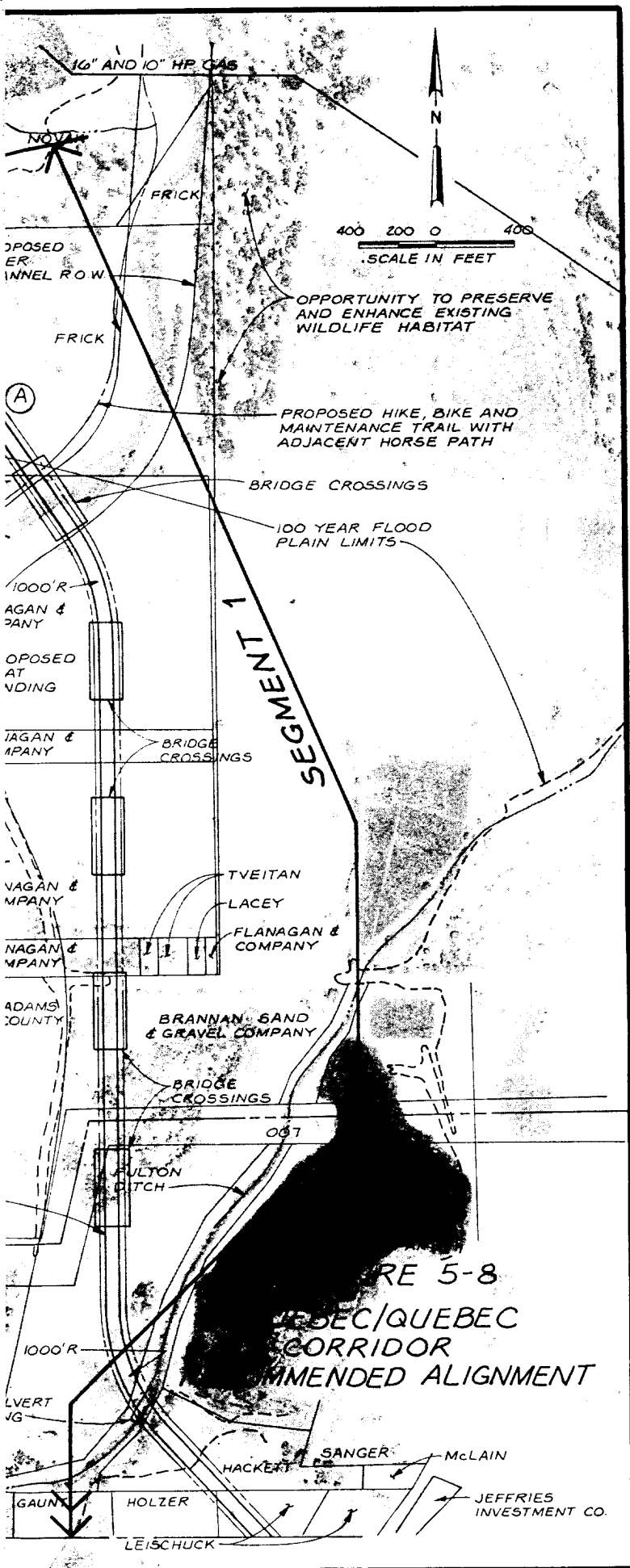
COLORADO BOULEVARD/YORK STREET

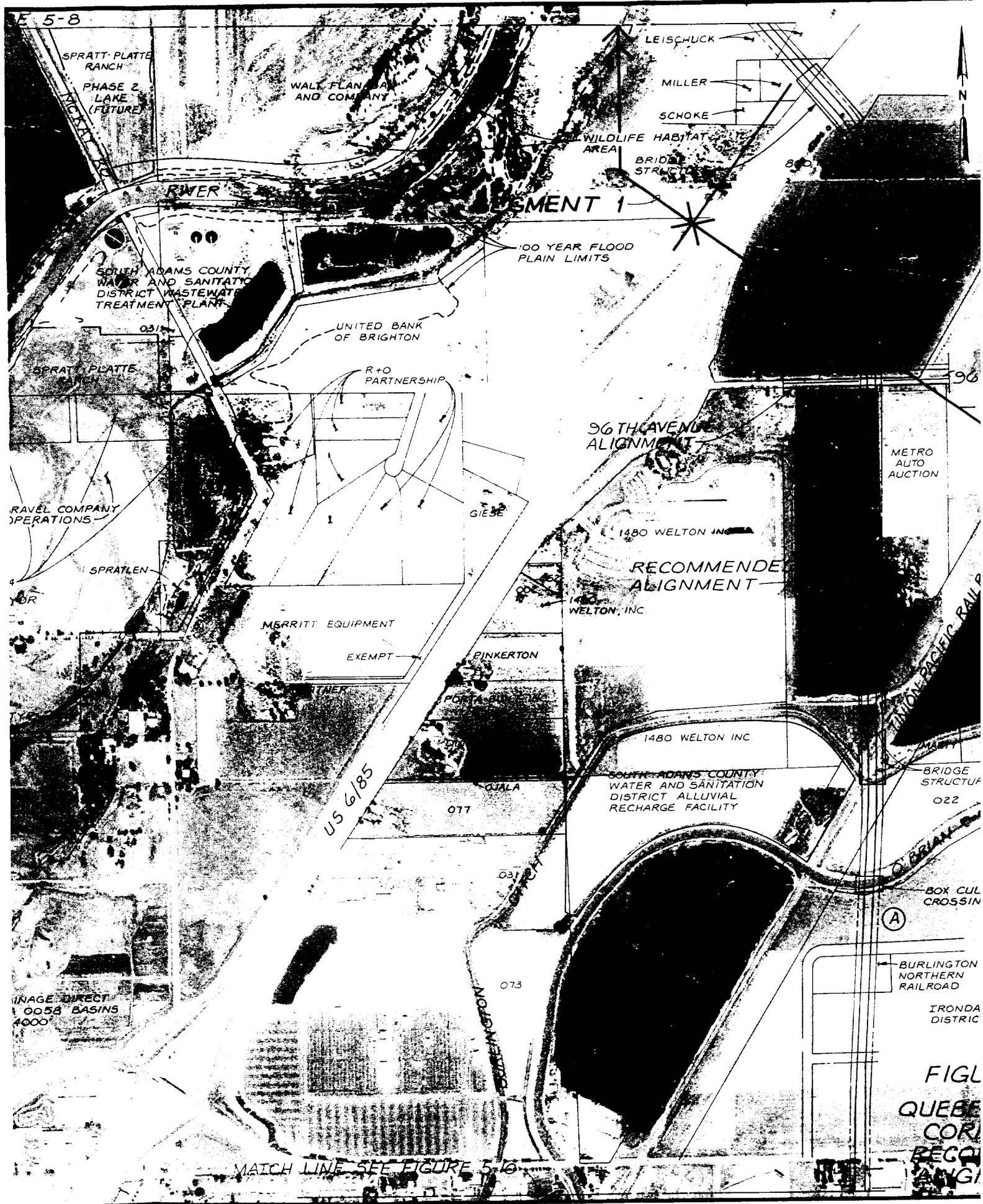
The recommended alignment for the Colorado Boulevard/York Street corridor is Alignment 1B-2B. This alignment begins as an extension of Colorado Boulevard south of 88th Avenue. It falls within designated right-of-way just east of the Thornton City Shops complex. It then curves to the west through the southeast corner of the Riverdale Farms Mobile Home Park and runs south approximately 700 feet east of Steele Street. It then turns southwest, crosses Steele Street and the Union Pacific Railroad tracks. It continues southwest to align with York Street approximately 1,800 feet north of its ending point at the 74th Avenue/York Street intersection.

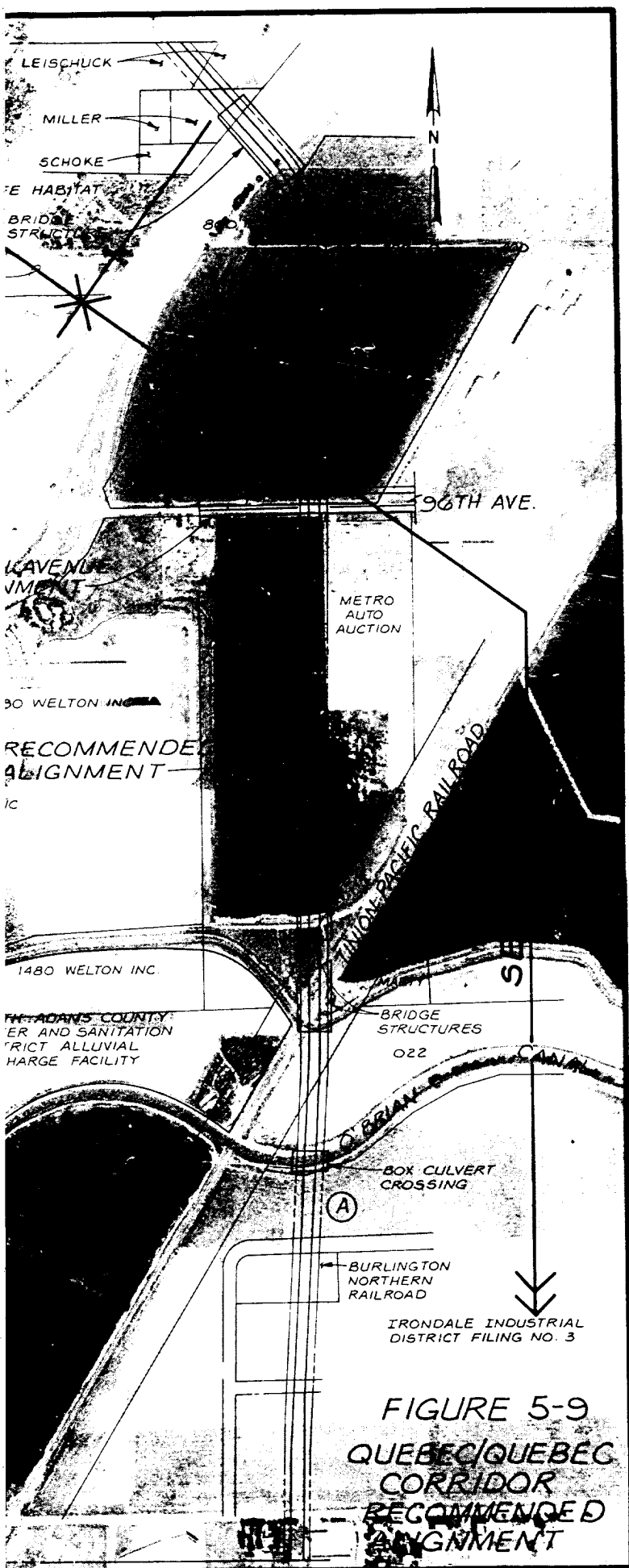
Alignment 1B-2B was recommended over the other alternative alignments because in the northern segment, it has more desirable geometry than Alignment 1C, and because it avoids the costly and impractical construction of Alignment 1A between gravel mining operations to the east and a reclaimed gravel mining lagoon to the west. In the southern segment, Alignment 2B is recommended because it has more desirable geometry and a straight approach to the 74th Avenue intersection, whereas Alignment 2A has more curves and intersects 74th Avenue just south of a curve. Also, although Alignment 2B splits several properties, Alignment 2A would require

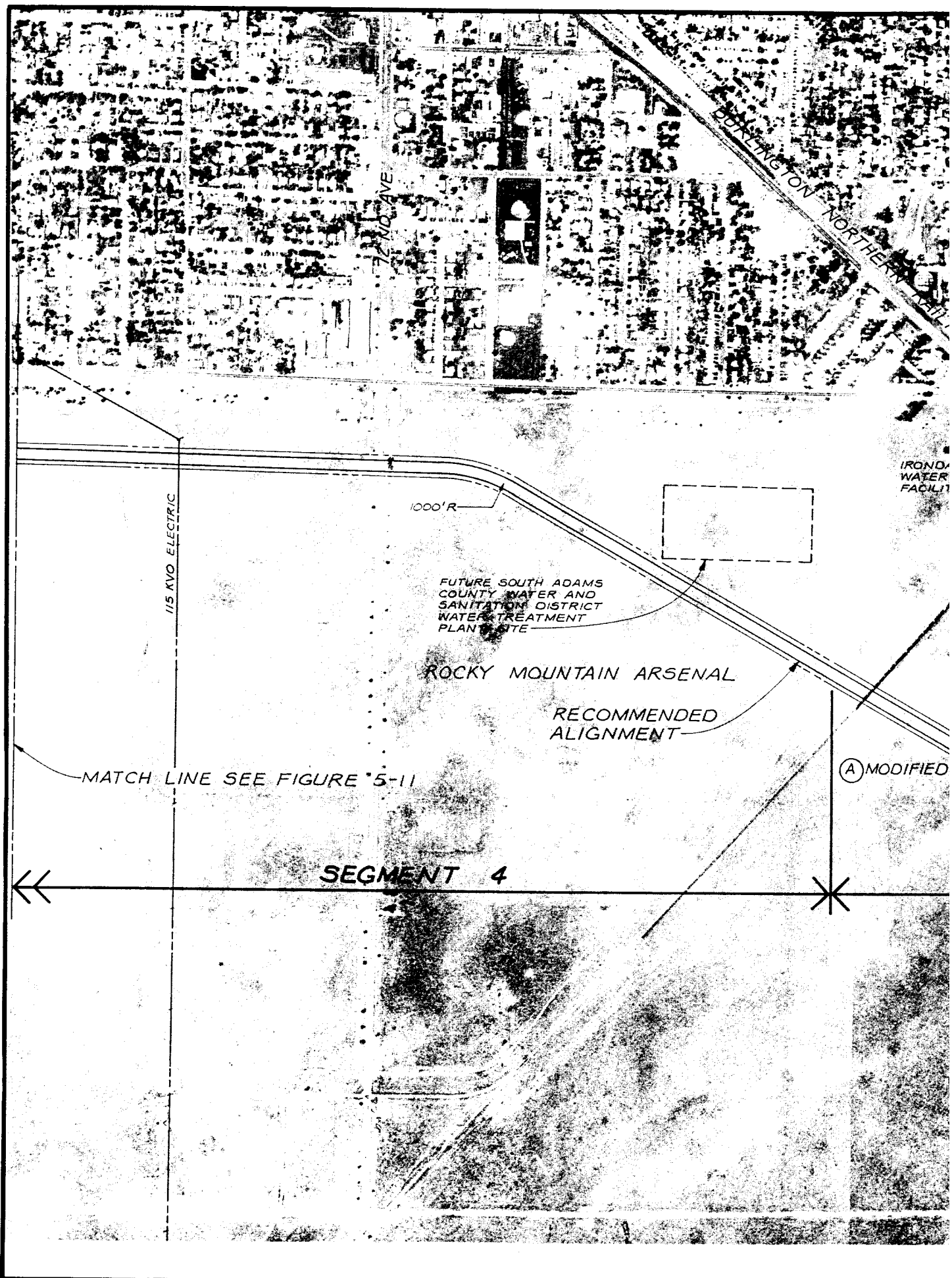


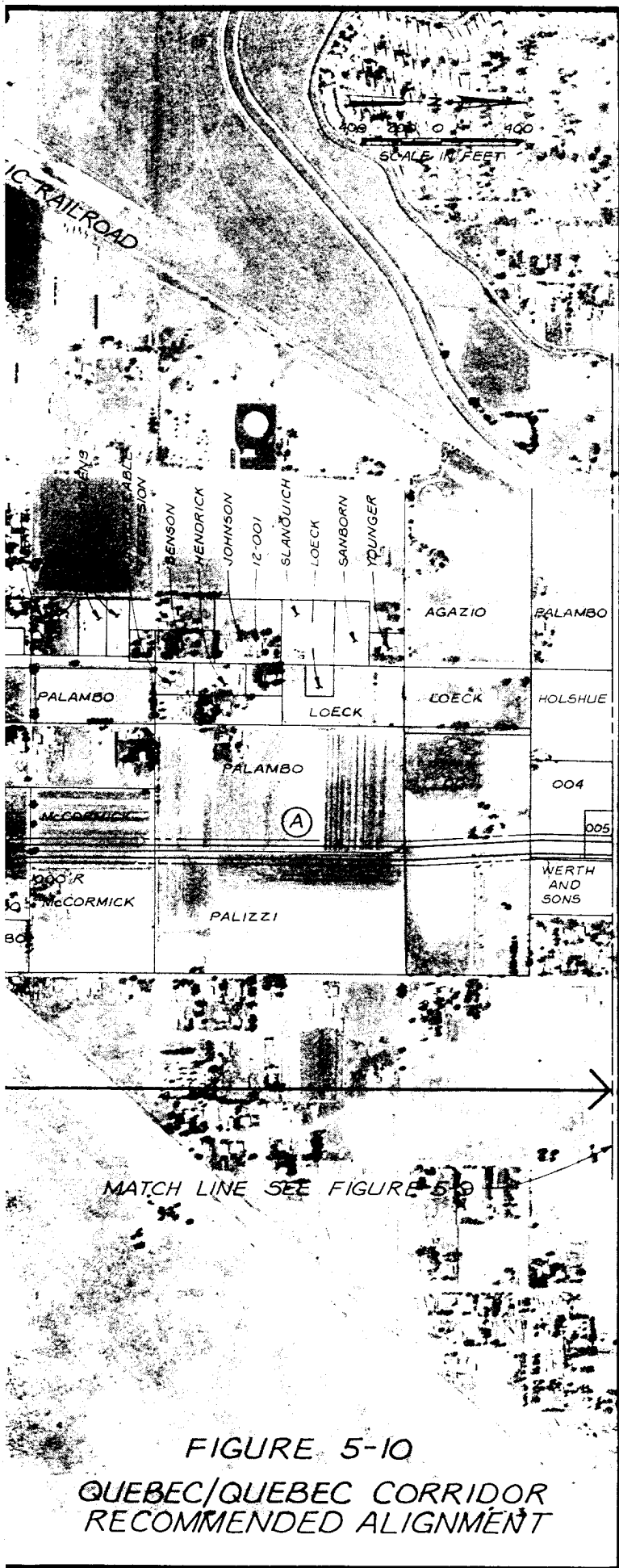


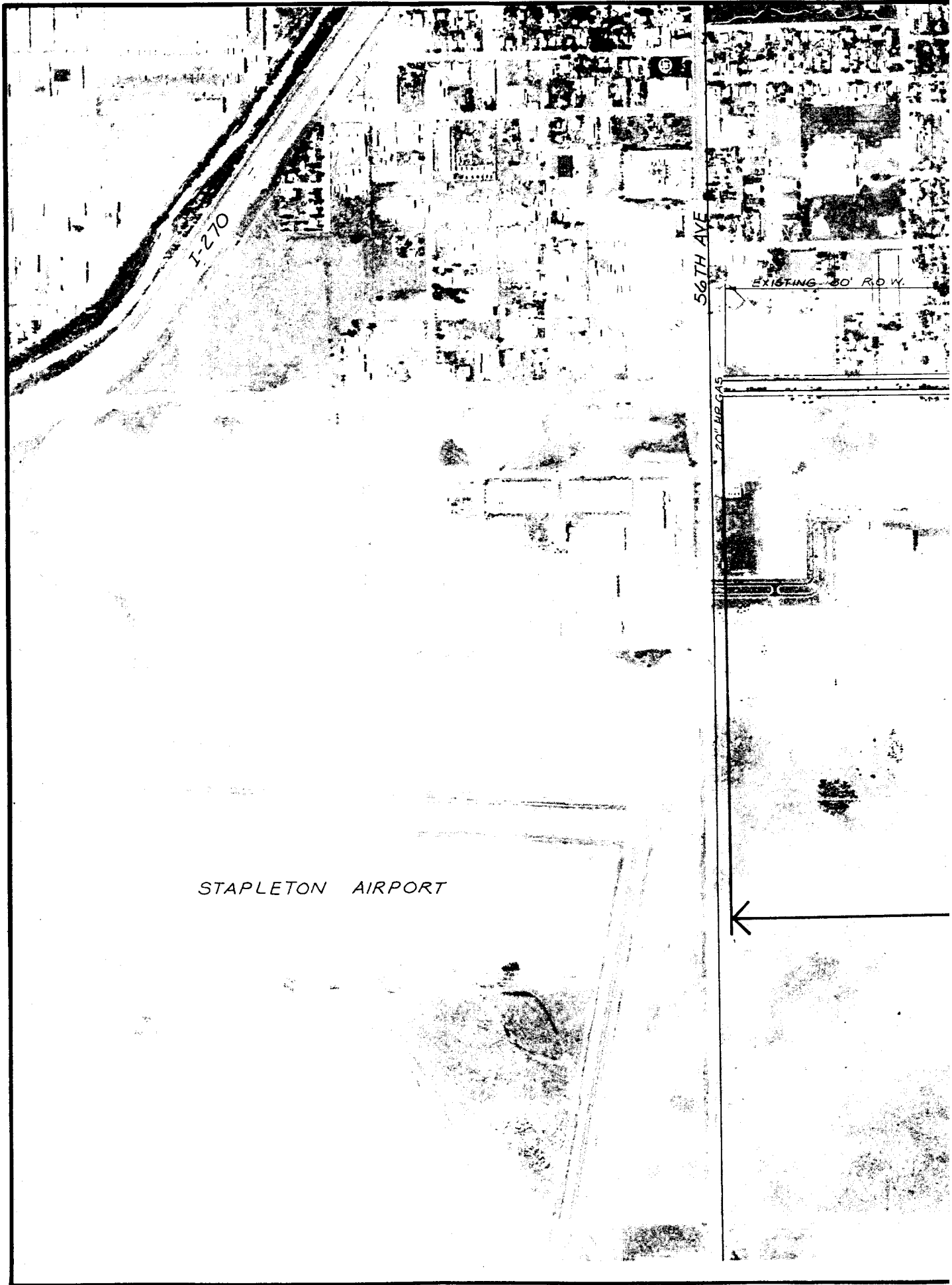












I-270

56TH AVE

EXISTING 80' R.O.W.

20' M.P.C.A.S.

STAPLETON AIRPORT



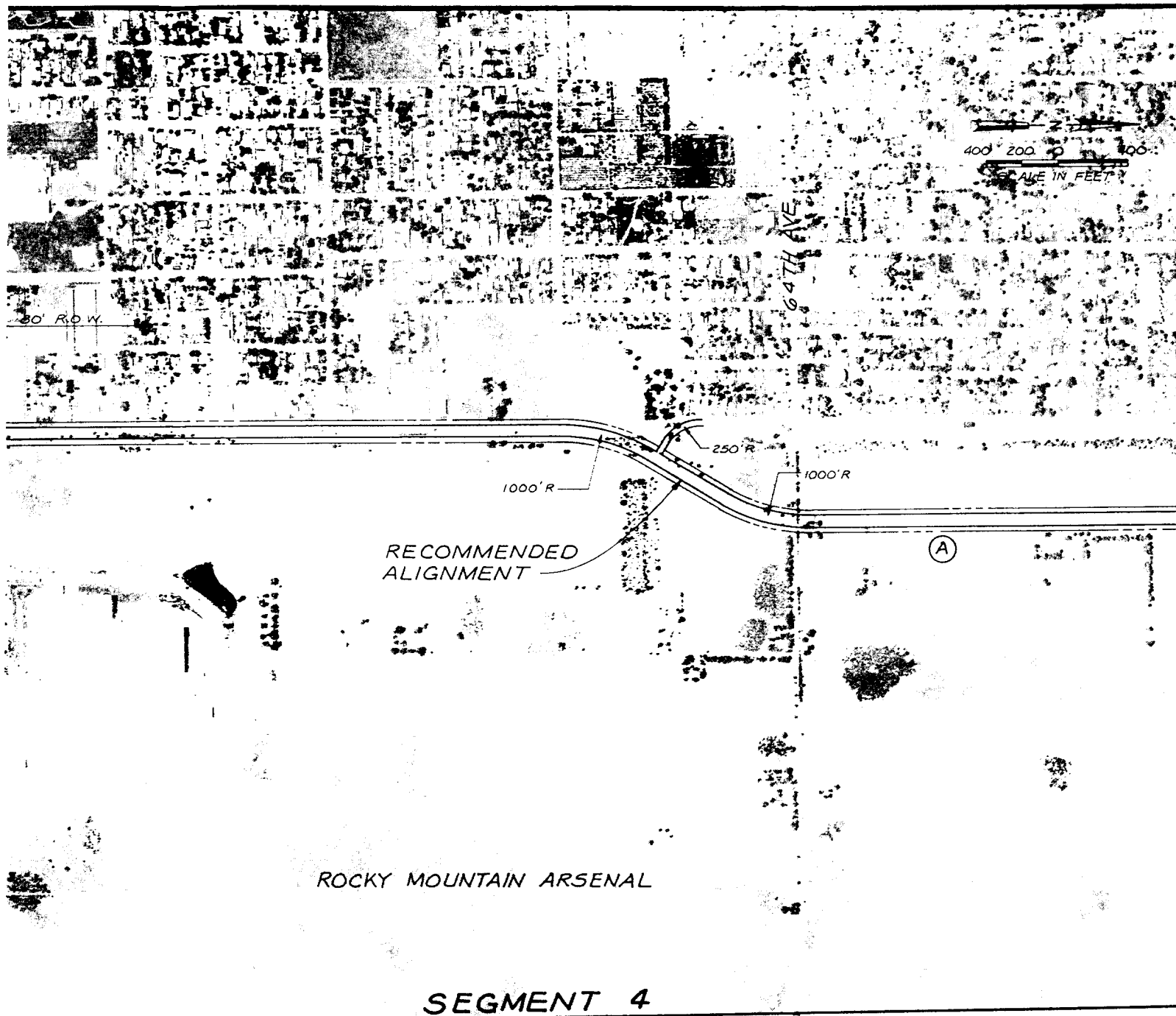


FIGURE 5-11
QUEBEC/QUÉBEC COR
RECOMMENDED ALIGN

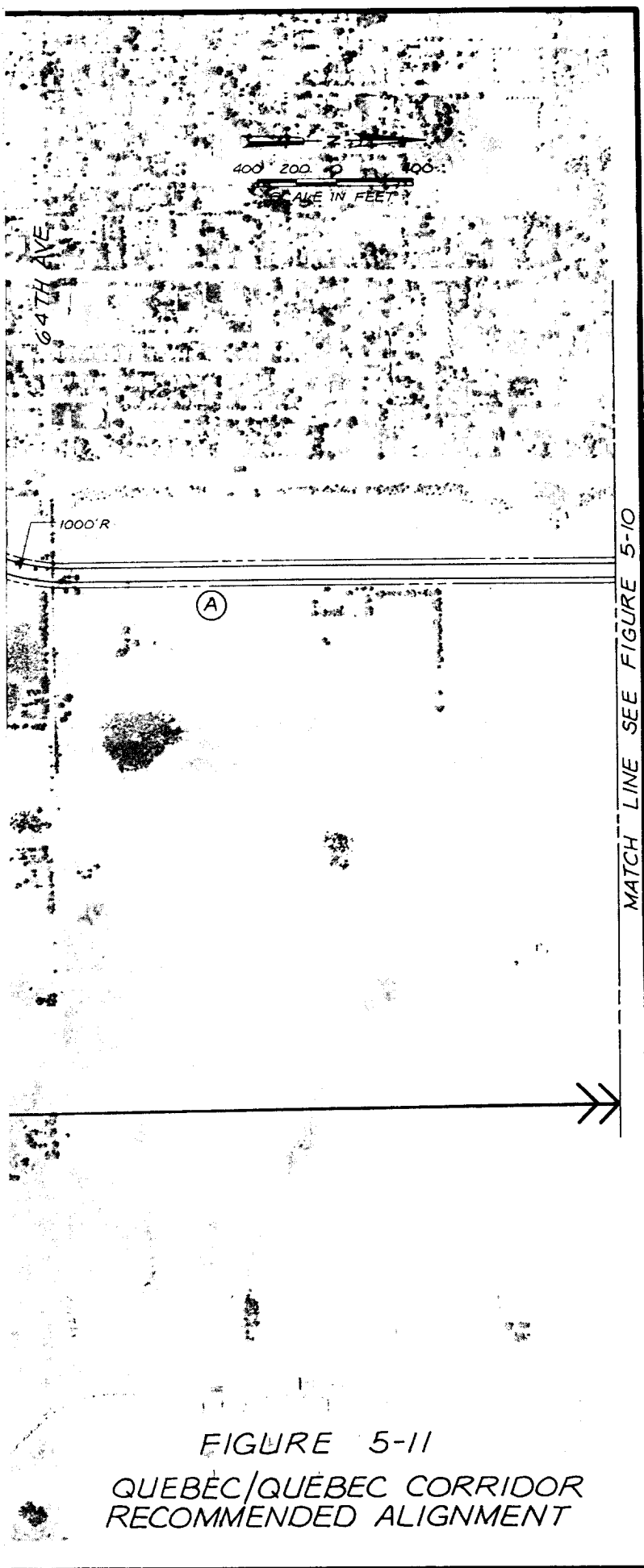


FIGURE 5-11
QUÉBEC/QUÉBEC CORRIDOR
RECOMMENDED ALIGNMENT

relocation of several additional residences. Figure 5-12 shows the recommended alignment for the Colorado Boulevard/York Street connection.

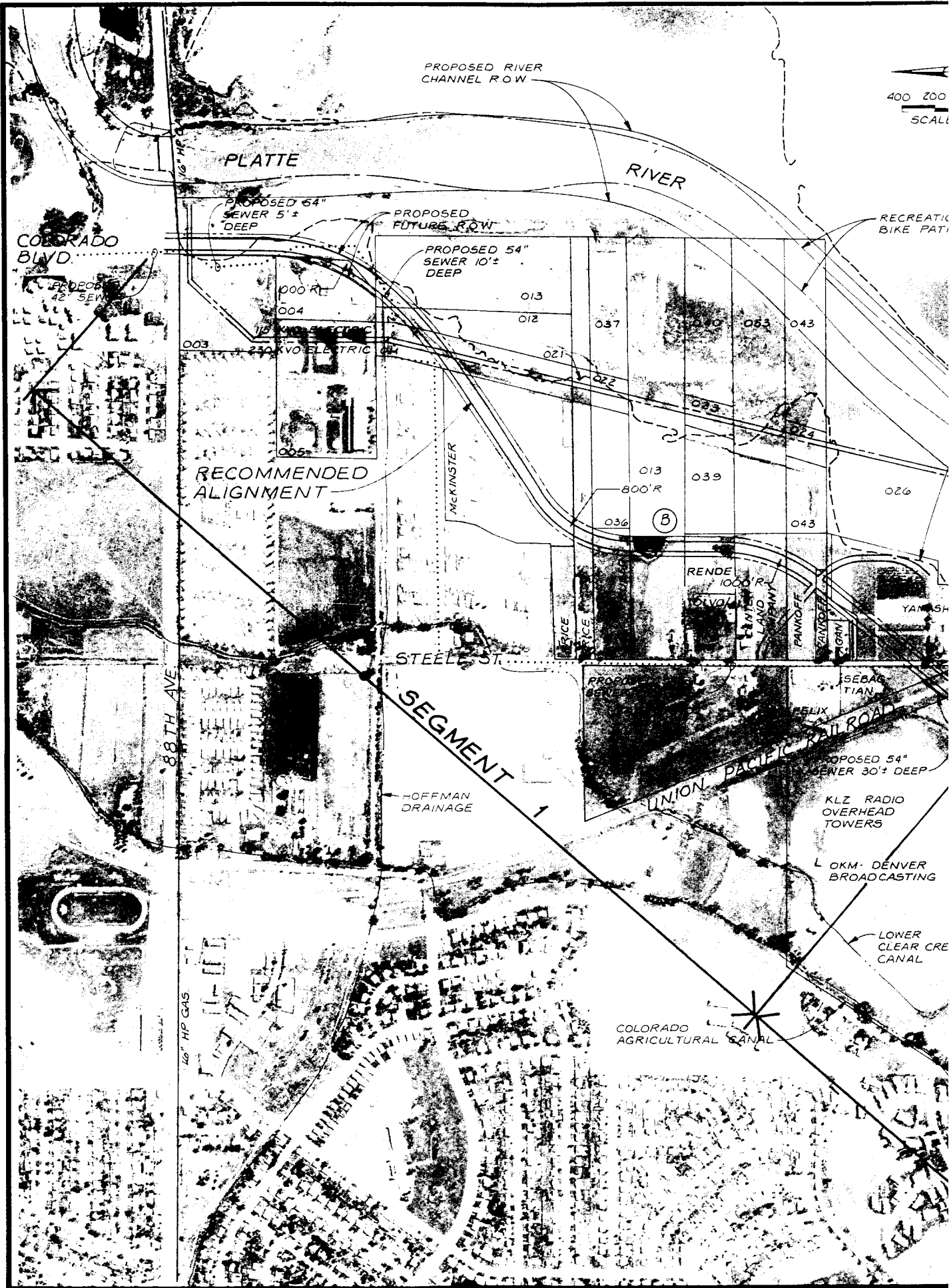
RAILROAD CROSSINGS

The recommended alignments described in this section cross existing railroad tracks at the following locations:

<u>Corridor</u>	<u>Railroad</u>	<u>Location</u>
96th Avenue	Union Pacific	Approximately 3/4 mile east of US 6/85
	Burlington Northern	At SH 2
Quebec Street/ Quebec Street	Union Pacific	At the Burlington Ditch
	Burlington Northern	At SH 2
Colorado Boulevard/ York Street	Union Pacific	At Niver Creek

The Colorado Public Utilities Commission (PUC) has a method for determining whether a grade-separated railroad crossing is warranted at a particular location. The method used an exposure rate based upon the product of the number of trains per day and the average daily vehicle traffic at that location. The PUC policy sets an exposure rate of 75,000 as a threshold value requiring grade-separated crossings and an exposure rate of 3,000 for installation of flashing lights.

Based on the PUC criteria, each of the crossing locations above should meet warrants for grade-separated crossings at the time it is constructed, with the exception of the Colorado Boulevard/York Street connection. There is an immediate need for the roadway improvements in this corridor, whereas, warrants for a grade-separated crossing will probably not be met for 5 to 10 years.



0 200 0 400
SCALE IN FEET

RECREATIONAL HIKE,
E PATH

100 YEAR FLOOD
PLAIN LIMITS

PROPOSED
60" SEWER

YAMASHITA

DEEP

IER
TING

ER
AR CREEK
AL



SEGMENT 2

1-76

54TH AVE.

72ND AVE.

PROPOSED 60" SEWER

BRIDGE OR BOX
CULVERT CROSSING
YAMASHITA
BRIDGE CROSSING

COSIMI

DISNER

D. MANNA

BRANNAN SAND
& GRAVEL

BRANNAN SAND
& GRAVEL

COSIMI

MITKOGSKI

COSIMI

GIREEN AND
HENKE

COSIMI

COSIMI

024
EXEMPT

TOLVO

D. TULLIO

MULORG

D. TULLIO

U-HAUL

W. ZUCA

DURSEY

PONZIO

LORENZO

SANDY INVESTMENT CO.

HUFFSMITH

FIORE

FIORE

KAR-GO
SERVICE

CIANCIO

DEPUE

WEAVER
ANDERSON

ROTELLO

CIANCIO

STORAGE
EQUITIES

EXISTING 120'
R.O.W.

YORK ST.

FIGURE 5-12
COLORADO/YORK CORRIDOR
RECOMMENDED ALIGNMENT

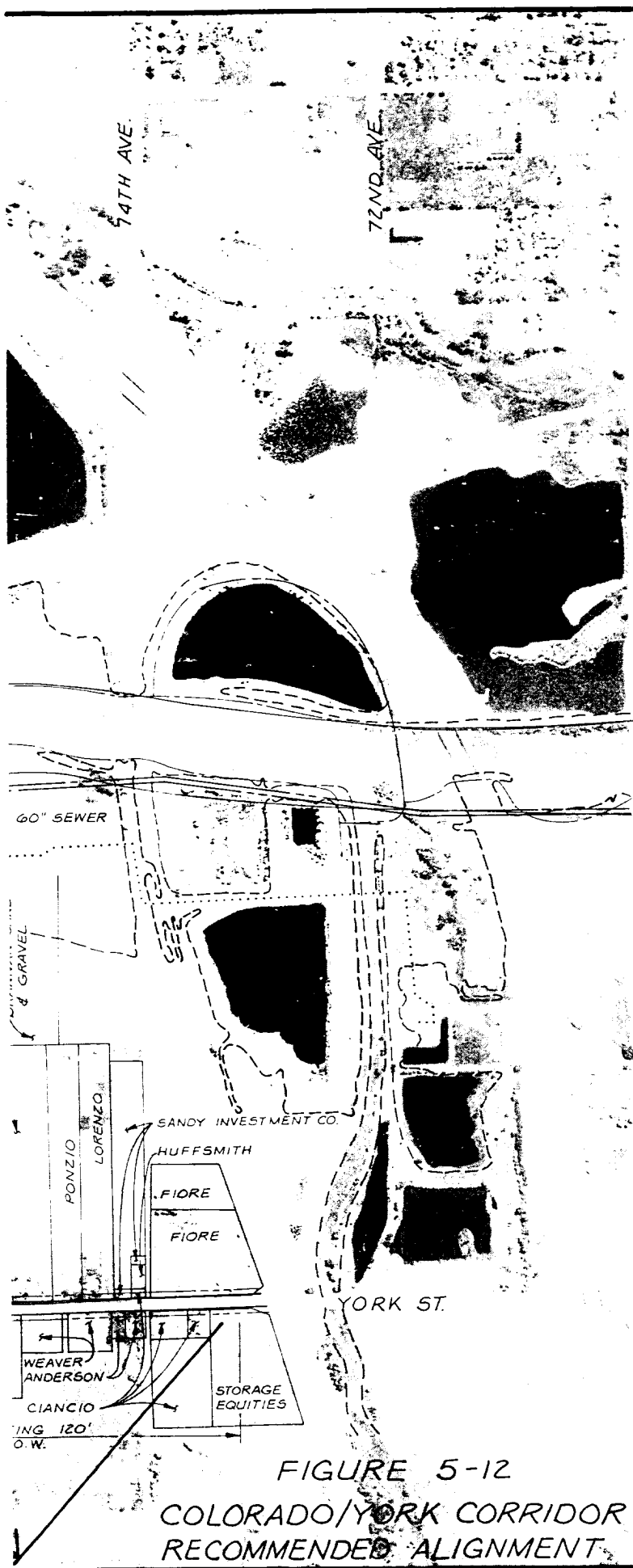


FIGURE 5-12
COLORADO/YORK CORRIDOR
RECOMMENDED ALIGNMENT

The previous discussion indicates the warrants required to justify grade-separated railroad crossings. For a grade separation to be constructed, funding from the PUC or another source must be available in addition to warrants being met. Funding for grade separations should be actively pursued to construct these crossings at the earliest possible timeframe in conjunction with the roadway improvements.

COSTS

In this section, conceptual level opinions of construction costs based on 1987 cost data of the Colorado Department of Highways are included for the recommended alignments in the study corridors. Because of the conceptual nature of this study, the costs are broken down as roadway, structure, and other costs. Roadway costs include costs of pavement, curb and gutter, bikeways, sidewalks, and earthwork. Structure costs include costs of bridge structures, box culverts, and other major drainageway crossings. Other costs include lighting, traffic signals, median and buffer area landscaping, storm drainage systems, and miscellaneous items. Right-of-way costs were not developed in this study, and therefore, are not included.

It should be noted that when the recommended alignments are constructed, construction of certain elements such as sidewalks and bikeways could be deferred to a later date if funding is not available for these elements.

Table 5-1 shows the conceptual level opinions of construction costs for the recommended alignments.

Table 5-1
CONCEPTUAL OPINION OF CONSTRUCTION COSTS
OF RECOMMENDED ALIGNMENTS

<u>Corridor</u>	<u>Overall Roadway Length</u>	<u>Roadway Costs</u>	<u>Structure Costs</u>	<u>Other Costs</u>	<u>Total</u>
96th Avenue	4.9 miles	\$10,662,000	\$21,411,000 ^a	\$4,523,000	\$36,596,000
Quebec Street/ Vasquez Boulevard	5.4 miles	19,118,000 ^b	35,379,000 ^c	5,855,000	60,352,000
Quebec Street/ Quebec Street	7.0 miles	15,278,000	26,672,000 ^a	6,458,000	48,408,000
Colorado Boulevard/ York Street	2.2 miles	5,624,000	4,750,000 ^a	2,057,000	12,431,000

^aIncludes costs of Railroad Grade Separations.

^bIncludes cost of Realigned Riverdale Road.

^cIncludes cost of Interchange at I-76/Vasquez Boulevard

IMPLEMENTATION PROGRAM

To implement the recommendations of this study, a process consisting of the following steps should be pursued by Adams County, Commerce City, and the City of Thornton:

- o Obtain adoption of this final study report by the Adams County Commissioners and the City Councils of Commerce City and the City of Thornton.
- o Pursue modification of the DRCOG Regional Plan to include the recommendations of this report.
- o Coordinate with CDOH for improvements that interface with or are included in the state highway system.

Appendix



Serving Local Governments Since 1955

Denver Regional
Council of
Governments

Suite 2008
Denver, Colorado 80211
(303) 455-1000

March 24, 1988

Mr. Rocky Carns
Adams County Planning Department
Mr. Steve House, Director
Commerce City Planning Department
Mr. Gene Putman
City of Thornton
c/o Adams County Planning Department
4955 East 74th Avenue
Commerce City, Colorado 80022

Gentlemen:

DRCOG staff has completed its review of the draft report for the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, Colorado Boulevard/York Street Transportation Study. The following comments are submitted for your consideration:

- The report recommends changing the laneages on the Regional Transportation Plan by:
 - increasing the lanes on the Quebec Street/Vasquez Boulevard connection from four to six lanes, and
 - decreasing the lanes on the York Street/Colorado Boulevard connection from six lanes to four lanes.

After reviewing the traffic volumes projected for this area, and in consideration of the more detailed study conducted, this switch in number of lanes between these two facilities warrants consideration as a plan amendment if agreed to by the involved local governments.

- Slight alignment changes are proposed to a number of roadways in the area, including:
 - the York Street/Colorado Boulevard transition is shown about one-half mile south of that shown on the 2010 Regional Transportation Plan,
 - the Quebec Street/Vasquez Boulevard connection is shown slightly west of the alignment on the 2010 Regional Transportation Plan, and

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Mr. Rocky Carns
Mr. Steve House
Mr. Gene Putman
March 24, 1988
Page 2

- the 96th Avenue offset from the existing roadway begins about one-half west of SH 2 rather than east of SH 2, as shown on the 2010 Plan.

Based upon the more detailed field work conducted as part of the study, such changes would appear justified.

- The report recommends adding to the Regional Plan a roadway which would connect Quebec Street south of 120th Avenue to Quebec Street south of SH 2. The justification for this roadway (see page 2-11 and 2-12) appears to be to provide for needed traffic demands and land service beyond the year 2010. As such, it would appear premature to add this facility to the 2010 Regional Transportation Plan. You may wish to explore the justification of adding the portion south of 88th Avenue to the 2010 RTP.

We appreciate the opportunity to review the draft report and hope that the comments provided will be useful in finalizing the document and preparing plan amendments.

Sincerely,



Jeff May
Highway and Transit Coordinator

JM/js

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

District 6

2000 South Holly Street
Denver, Colorado 80222
(303) 757-9011



RECEIVED

MAR 22 1988

DENVER
CH2M HILL

March 18, 1988

Mr. Thomas K. Ragland PE
Project Engineer
CH2M Hill
6060 South Willow Drive
Greenwood Village, Colorado 80111-5112

Dear Tom:

Thank you for the opportunity to review and comment on the 96th Avenue, Quebec Street/Vasquez Boulevard, Quebec Street/Quebec Street, Colorado Boulevard/York Street draft Transportation Study. We applaud your efforts to establish an integrated transportation network throughout their communities. The study provides a base for planning regional transportation needs in the four roadway corridors. The basic concepts presented in the study and the recommended alignments appear to be feasible. The intersections of 96th Avenue and Quebec Street extension with SH-2 will require a more detailed design effort due to the problems created by the proximity of the railroad, the skew of the alignments and the location of the Rocky Mountain Arsenal water treatment facility.

We look forward to working with the aforementioned entities to achieve the improvements to the regional transportation system in this area.

Very truly yours,

GUILLERMO V. "BILL" VIDAL
District Engineer

A handwritten signature in dark ink, appearing to read "L E Lipp", is written over the typed name of Louis E. Lipp.

by: LOUIS E. LIPP
Traffic and Safety Engineer

LEL/GEP/jeg #12-23-24

cc: G. Vidal
Lipp, Muscatell
File and RF



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY

ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO 80022-2180

March 21, 1988

Facilities Engineering
Division

SUBJECT: Draft Transportation Study Report

RECEIVED

MAR 23 1988

DENVER
CH2M HILL

Ms. Chris Bisio
CH2M HILL
P.O. Box 22508
Denver, Colorado 80222

Dear Ms. Bisio:

The Draft Report has been reviewed by my staff. The following comments are provided:

a. In general, the Army policy towards future Rocky Mountain Arsenal (RMA) land use is subject to the interactions with the cleanup process. The 96th Avenue route has no interaction; therefore, it appears that there is no problem.

b. The Quebec Street corridor alignments A and B are unacceptable at this time because of the interference with Irondale Ground Water Treatment Facility.

c. The Quebec Street corridor alignment A Modified will require additional review by all cleanup parties involved before providing a response.

The Program Manager for RMA Cleanup has been provided two copies of the Draft Report for review and comments. He will provide any comments directly to you.

If there is any additional information required, please contact me at 289-0115 or Mr. James L. Green, 289-0166.

Sincerely,

David L. Heim
Director, Installation Services

Copy Furnished:

Office of the Program Manager for Rocky Mountain Arsenal
Contamination Cleanup, ATTN: AMXRM-PM, Aberdeen Proving
Ground, MD 21010-5401

RECEIVED

MAR 17 1988

DENVER
CH2M HILL

L. Scott Tucker, Executive Director

March 15, 1988



Chris Bisio
CH2M Hill
6060 South Willow Drive
P.O. Box 22508
Denver, Colorado 80222

Dear Chris:

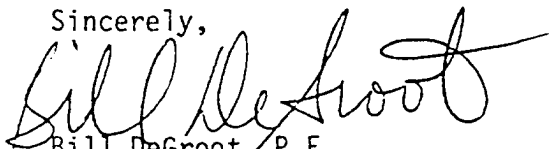
This letter is in response to your request for our comments concerning a draft report for the 96th Avenue, Et. Al. Transportation Study dated February, 1988. We appreciate the opportunity to review the draft report.

We have reviewed this report only as it relates to major drainageways. We have the following comments to offer:

1. For the most part, the report recognizes the existence of the major drainageways we have studied and the master plans we have developed. First Creek has been omitted from Table 4-8 even though it is shown on Figure 4-7.
2. Some portions of these alignments, particularly the Quebec/Vasquez corridor between 104th and 120th will require crossing structures which may not be readily apparent because the drainageways essentially disappear when they hit the South Platte River floodplain. As development continues to occur in these basins, the need will be there to transport the water across the South Platte River floodplain to the river channel.
3. We would suggest a general comment that close coordination be required with the Urban Drainage and Flood Control District as any of the segments proceed into preliminary and final design. This is particularly true with the South Platte River where our South Platte River Program is actively pursuing implementation of the South Platte River Master Plan.

If you have any questions concerning these comments, please contact me.

Sincerely,


Bill DeGroot, P.E.
Chief, Flood Plain Management

WGD/gb

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TRANSPORTATION STUDY FOR 96TH AVENUE
QUEBEC STREET AND COLORADO/YORK CONNECTION
PUBLIC MEETING
THORNTON CIVI CENTER
DECEMBER 10, 1987

SIGN-IN SHEET

Name

Address

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Tom Ragland	"	"
Candace Stowell	Adams County	
C.S. Dager	431 W. 84th	428-4999
Chuck Warner	2040 E 84 th Thornton	287-1105
Norris J. Spencer	P.O. Box 21887 Denver	287-2248 W 287-8010 H
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 PUBLIC MEETING
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 DECEMBER 10, 1987

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Name

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Mary Lambert

11921 E. 96th Ave.
 Commerce City, CO 80022

— 289-2018

TRANSPORTATION STUDY FOR 96TH AVENUE, QUEBEC STREET, AND
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Nancy Lambert	11921 E. 96th Ave.	289-2015
Tommy Coarini	2401 E. 78	288-0320
Richard Larson	1121st & Riverdale Rd.	452-8265

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James Larson	Rt #2 Box 539 Denver	452-8252

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Julie L. Schindler	11500 Riverdale Rd.	451-7962
TOM PALIZZI	575 CENTRAL DR	654-0821

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